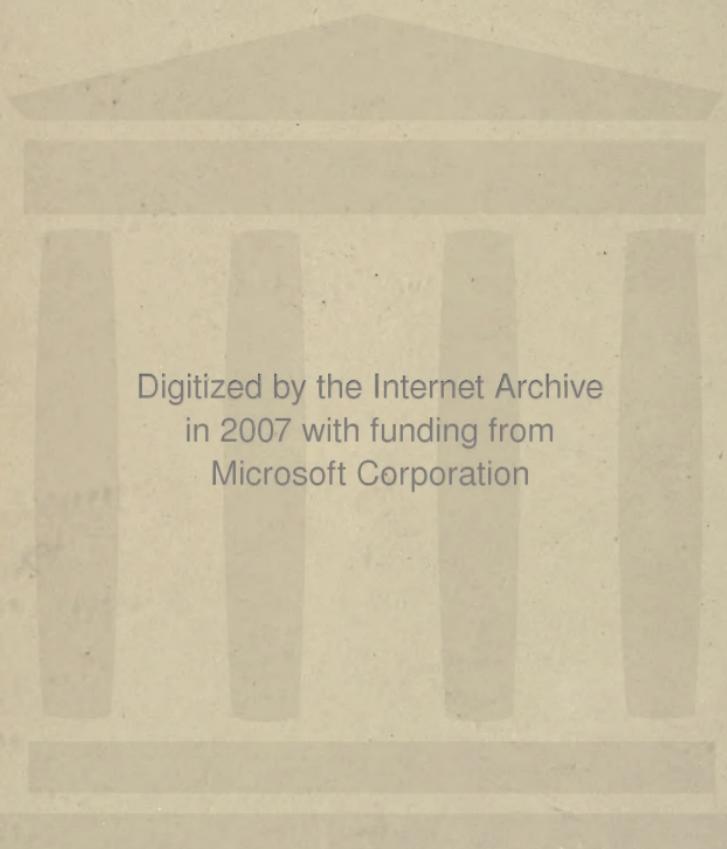




A GUIDE TO DISEASES OF THE
NOSE AND THROAT



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A GUIDE TO DISEASES OF THE NOSE AND THROAT AND THEIR TREATMENT

BY

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WITH 255 ILLUSTRATIONS

Obsta principiis—OVID.

· · · · · *venienti occurrite morbo.*—PERSIUS.

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LONDON
EDWARD ARNOLD
41 & 43 MADDOX STREET, BOND STREET, W.
1906

TO MY
COLLEAGUES
AND MY
PUPILS
FROM ALL OF WHOM I HAVE LEARNED MUCH
I DEDICATE THIS BOOK

PREFACE

To acquire the necessary dexterity to examine a patient systematically so as to overlook nothing, to recognise and put in its proper place the particular pathological condition found, and finally, but chiefly, to treat both the patient and the local abnormality successfully, seem to me the three most important objects of a course of study at a special hospital. This book, which is founded on lectures given at the Throat Hospital with these objects in view, is now published in the hope of helping those who are either attending or have attended a short course of study at special Departments or special Hospitals for Diseases of the Throat and Nose. I trust the former may find it a useful guide to examination, diagnosis and treatment, and the latter a help in putting into practice the knowledge they have gained.

In dealing with the many and varied diseases which may affect the Upper Respiratory Tract, it is undesirable to follow any one plan too rigidly; but in the main I have endeavoured to discuss etiology chiefly from the point of view of preventive treatment, to describe the gross pathology or naked eye changes sufficiently fully to help in diagnosis, to lay stress on those symptoms which require special treatment or are characteristic of the particular disease, and to give a full and detailed account of the various methods of treatment.

I have obtained much help from the published works of many authors—British, Continental and American—whose opinions are as far as possible acknowledged in the text. I am fully aware, however, that the names of many authors, whose works have materially added to our knowledge, are omitted, but the scope of this book does not admit of a *résumé* of all the valuable work which has been accomplished during the last ten years. If, however, credit is not given where credit is due, I am truly sorry.

I am much indebted to many friends, and amongst others it gives me great pleasure to acknowledge my obligations to my colleague, Dr. H. L. Lack, for much useful criticism, to Dr. James Atkinson and Mr. F. A. Rose for reading the manuscript and for making many useful suggestions, and to Dr. E. A. Peters for help in correcting the final proofs. I must also express my gratitude to Dr. T. J. Horder for giving me the opportunity of discussing with him several points bearing on general medicine.

In the matter of illustrations I wish particularly to express my sincere thanks to Dr. Morell Mackenzie, who has kindly placed at my disposal the blocks illustrating Sir Morell Mackenzie's book on Diseases of the Throat and Nose. Seventy of these finely executed drawings I have used with pleasure, being of opinion that they are more useful, especially for teaching purposes, than many of the coloured illustrations of more recent production.

I am also indebted to Dr. J. E. Adler for many original drawings, to Dr. Logan Turner and Dr. Lack for the loan of a few blocks, and to my house-surgeon, Dr. C. Mon Stewart, for kindly assistance in superintending the photographic illustrations.

Finally, I must express my gratitude to Messrs. Mayer & Meltzer for the illustrations of instruments, and to Mr. S. W. Ord of Messrs. Bullock & Co. for carefully checking the prescriptions and the correctness of the metric weights and measures.

C. A. P.

HARLEY STREET,
LONDON, W., *June 1906.*

CONTENTS

SECTION I

GENERAL

CHAP.		PAGE
I.	METHODS OF EXAMINATION OF THE UPPER RESPIRATORY TRACT	1
II.	METHODS OF LOCAL TREATMENT, WITH FORMULÆ	28
III.	ON OPERATIVE TREATMENT	61

SECTION II

COMPLICATIONS OF THE UPPER RESPIRATORY TRACT IN RELATION TO GENERAL MEDICINE

IV.	COMPLICATIONS IN THE COURSE OF ACUTE SPECIFIC FEVERS	86
V.	COMPLICATIONS IN CHRONIC INFECTIVE DISEASES: TUBERCULOSIS	97
VI.	COMPLICATIONS IN CHRONIC INFECTIVE DISEASES (<i>Continued</i>)—SYPHILIS, LEPROSY, GLANDERS, RHINOSCLEROMA	142
VII.	COMPLICATIONS IN ORGANIC AND CHRONIC CONSTITUTIONAL DISORDERS	173

SECTION III

DISEASES OF THE NOSE

VIII.	ACUTE INFLAMMATORY AFFECTIONS OF THE NOSE	189
IX.	CHRONIC INFLAMMATORY AFFECTIONS OF THE NOSE—CHRONIC RHINITIS	208
X.	CHRONIC INFLAMMATORY AFFECTIONS OF THE NOSE (<i>Continued</i>)—AFFECTIONS OF THE ACCESSORY SINUSES	246
XI.	CHRONIC INFLAMMATORY AFFECTIONS OF THE NOSE (<i>Continued</i>)—RHINITIS SICCA, CHRONIC PURULENT RHINITIS, ATROPHIC RHINITIS, RHINITIS CASEOSA	298
XII.	AFFECTIONS OF THE SEPTUM AND ALÆ NASI	322
XIII.	NASAL NEUROSES	352
XIV.	NEW GROWTHS OF THE NASAL PASSAGES	368
XV.	EPISTAXIS, FOREIGN BODIES, RHINOLITHS	375

SECTION IV

DISEASES OF THE NASO-PHARYNX

XVI.	ADENOIDS	382
XVII.	POST-NASAL CATARRH, TUMOURS, FOREIGN BODIES	406

CONTENTS

SECTION V

DISEASES OF THE ORO-PHARYNX

CHAP.	PAGE
XVIII. ACUTE INFLAMMATORY AFFECTIONS OF THE PHARYNX AND TONSILS	415
XIX. CHRONIC INFLAMMATORY AFFECTIONS OF THE PHARYNX AND TONSILS	440
XX. NEW GROWTHS OF THE PHARYNX	462
XXI. NEUROSES AND UNCLASSIFIED CONDITIONS OF THE PHARYNX	472

SECTION VI

DISEASES OF THE LARYNX

XXII. ACUTE INFLAMMATORY AFFECTIONS OF THE LARYNX	484
XXIII. CHRONIC INFLAMMATORY AFFECTIONS OF THE LARYNX	510
XXIV. NEUROSES OF THE LARYNX	536
XXV. NEW GROWTHS OF THE LARYNX	562
XXVI. INJURIES, FOREIGN BODIES, CONGENITAL DEFORMITIES OF THE LARYNX	588
APPENDIX. NOTIFICATION AND ISOLATION OF CASES OF FIBRINOUS RHINITIS	599
INDEX	603

LIST OF ILLUSTRATIONS

FIG.		PAGE
	The Upper Respiratory Tract	facing 1
1.	Mackenzie's wall-bracket lamp	2
2.	Author's combined lamp	3
3.	Baber's portable lamp	3
4.	Frontal mirror	4
5.	Relative position of surgeon and patient	5
6.	Thudichum's nasal speculum	6
7.	Browne's nasal speculum	6
8.	Gruber's ear speculum	6
9.	Method of holding Thudichum's speculum	6
10.	Thudichum's speculum in position	7
11.	Killian's nasal speculum	8
12.	Nasal probe and wool carrier	8
13.	Lack's tongue depressor	10
14.	Fränkel's tongue depressor	10
15.	The author's tongue depressor	11
16.	Method of using a tongue depressor	11
17.	Post-nasal mirror	12
18.	Michael's post-nasal mirror	13
19.	Method of warming mirrors	13
20.	Examination of the post-nasal space	14
21.	Normal appearances of the naso-pharynx	15
22.	White's palate hook	16
23.	Digital examination of the naso-pharynx	17
24.	Twisted epiglottis	18
25.	Diagram of the inversion of the laryngeal image	20
26.	Method of holding the patient's tongue	21
27.	Method of holding the mirror	22
28.	Parts seen during quiet inspiration	22
29.	Parts seen during phonation	23
30.	View of the anterior wall of the trachea	23
31.	View of the posterior wall of the trachea	24
32.	Nasal forceps	28
33.	Post-nasal syringe	30
34.	Laryngeal spray	31
35.	Hovell's cautery handle	32
36.	De Vilbiss metal nebuliser	33
37.	Woakes' chromic acid carrier	36
38.	Laryngeal wool carrier	38
39.	Post-nasal wool carrier	39
40.	Kabierskie's insufflator	41
41.	MacDonald's insufflator	42
42.	De Vilbiss sprays and insufflators	43
43.	Nasal cup	46
44.	Nasal irrigator	46
45.	Nasal syringe	46
46.	Rouse's nebuliser	49

LIST OF ILLUSTRATIONS

FIG.		PAGE
47.	Mackenzie's respirator	53
48.	Hovell's insufflator	54
49.	Method of using Leduc's auto-insufflator	55
50.	Introduction of laryngeal forceps	68
51.	Laryngeal forceps in position	69
52.	Cooper Rose's bag	74
53.	Laryngotomy tube and pilot	76
54.	Durham's tracheotomy tube	78
55.	Parker's tracheotomy tube	78
56.	O'Dwyer's tube and introducer	81
57.	Hahn's tube	82
58-61.	Localised tuberculous tumours	100-101
62.	Tuberculous subglottic oedema	101
63-64.	Early tuberculous infiltration and ulceration	101-102
65-66.	Tuberculous granulations	102-103
67.	Superficial tuberculous ulcers of the epiglottis	103
68-71.	Various stages of tuberculous infiltration and oedema	103-104
72.	Oedematous infiltration with superficial ulceration	104
73-74.	Deep destructive tuberculous ulceration	104-105
75.	Krause's laryngeal forceps and snare	114
76.	Lake's laryngeal forceps	115
77.	Heryng's curettes and knives	120
78.	Barwell's epiglottis punch forceps	121
79.	Lupus of the soft palate	133
80-81.	Lupus of the larynx	134
82.	Syphilitic erythema of the palate	144
83.	Condyloma of the epiglottis	145
84-85.	Tertiary syphilis of the pharynx	151
86-87.	Circumscribed gummata of the larynx	152
88.	Superficial tertiary ulceration of the epiglottis	152
89.	Deep ulceration of a circumscribed gumma	152
90-91.	Diffuse gummato infiltration with destructive ulceration	153
92.	Cicatricial web between the vocal cords due to syphilis	153
93.	Stricture of the trachea due to syphilis	153
94.	Syphilitic cicatrices of the epiglottis	154
95.	Calomel insufflator	159
96.	Eckstein's paraffin syringe	160
97.	Mackenzie's guarded laryngeal knife	163
98.	Lack's tracheotomy tube and laryngeal plug	165
99.	Saddle-back nose, the result of syphilis	166
100-101.	Hyperplasia of the inferior turbinate	214
102-104.	Hyperplasia of the posterior ends of the inferior turbinates	215-216
105.	Cautery point	218
106.	Nasal scissors	220
107.	Removal of the anterior end of the inferior turbinate	221
108.	Lack's snare	221
109.	Mackenzie's snare	222
110.	Method of bending loop of snare	222
111.	Removal of the posterior end of the inferior turbinate	223
112.	Carmalt Jones' spokeshave	224
113.	Large nasal polypus	229
114.	Polypi growing from the outer wall of the nose	230
115.	Mahu's cutting forceps	233
116.	Grunwald's punch forceps	234
117-118.	Methods of removing the anterior end of the middle turbinate	234-235

LIST OF ILLUSTRATIONS

xiii

FIG.	PAGE	
119. Badgerow's snare	238	
120. Krause's snare	238	
121. Mayer's ring knife	242	
122. Outer wall of the left nasal cavity	247	
123. Vertical coronal section of the skull	248	
124. The outer wall of the nose after removal of the superior and middle turbinates	249	
125. Diagram of the accessory sinuses	250	
126. Heryng's lamp for transillumination	268	
127. Appearances on transillumination under normal conditions	facing	268
128. Appearances on transillumination with right side dark	268	
129. Method of performing alveolar puncture	270	
130-131. Antrum drills	271	
132. End-piece for antrum syringe	272	
133. Lichtwitz's trochar	273	
134. Puncture of maxillary antrum through inferior meatus	274	
135. Tilley's burr	275	
136. Author's antrum cannula	276	
137. Bond's burr	276	
138-139. Carwardine's cutting forceps	277	
140. Large burr for canine opening	279	
141. Antrum plug for canine opening	281	
142. Hajek's hook	282	
143. Hartmann's frontal sinus probe and cannula	286	
144. Lombard's bone forceps	291	
145-146. Lack's silver and rubber plugs for maintaining drainage after opening the frontal sinus	293	
147. Sphenoidal sinus forceps	294	
148. Watson Williams' cutting forceps	296	
149. Nasal syringe	313	
150. Lake's paraffin syringe	317	
151. The nasal septum	323	
152. Diagrams of septal spurs and deviations	325	
153. Dislocation of the anterior cartilage of the septum	326	
154. Knife for the septum	328	
155. Moure's spokeshave	329	
156. The author's nasal saw	329	
157. Diagram of faulty incision in Gleason's operation	331	
158. U-shaped incision, Gleason's operation	332	
159. Diagram of the result of Gleason's operation	333	
160. Lake's nasal rubber splint	333	
161. Moure's scissors	334	
162. Diagram of Moure's incisions	335	
163. Moure's dilator and moulding forceps	335	
164. Asch's straight and angular scissors	336	
165. Smith's septal forceps	337	
166. Vulcanite nasal splint	337	
167. Diagram of operation for deviation	338	
168-172. Instruments for Killian's resection	340-342	
173. Abscess of the septum nasi	346	
174. Major's nasal knife	348	
175. Deformity of the alæ nasi	350	
176-177. Francis' nasal props and their use	350	
178. Adenoids as seen by posterior rhinoscopy	383	
179. Antero-posterior section of skull showing adenoids	383	
180. Adenoids after removal	384	
181. Facial appearances in the case of adenoids	385	

FIG.	PAGE
182. High arched palate, the result of nasal obstruction	386
183. Irregularity of the teeth, the result of nasal obstruction	386
184-185. Deformity of the chest, before and after treatment	388-389
186. Doyen's mouth gag	398
187. Loewenberg's forceps	398
188. Post-nasal curette	399
189. Bark's gag	400
190. Bursa-like cavity between two lateral pads of adenoids	407
191. Fibro-mucous polypus (post-nasal)	410
192. Acute peritonsillitis	426
193. Uvula forceps	447
194. Angular scissors for uvula	448
195. Normal oro-pharynx	449
196-197. Diagram showing tonsillar enlargements	452
198. Mackenzie's tonsillotome	453
199. Method of removing tonsil	453
200. Epithelioma of the soft palate	466
201. Perforation of the anterior pillar of the fauces (syphilitic)	481
202. Perforation of the anterior pillars of the fauces (congenital)	481
203-204. Chronic inflammatory thickening of the inter-arytenoid fold	515
205-206. Singer's nodules	519
207. Grant's laryngeal forceps	520
208. Pachydermia of the vocal processes	522
209. Pachydermia of the inter-arytenoid fold	522
210. Chronic perichondritis of the larynx	531
211. Fixation of left vocal cord (probably syphilitic)	534
212-215. Four main positions of the vocal cords	537
216-217. Double abductor paralysis	547
218-219. Complete paralysis of the left recurrent nerve	551
220. Attempted phonation in functional aphonia	553
221. Mackenzie's endo-laryngeal electrode	555
222. Paralysis of the arytenoideus muscle	557
223. Bilateral paralysis of the internal tensors of the cords	557
224. Bilateral paralysis of the external tensors of the cords	558
225-226. Papillomata of the larynx in children	563
227-232. Papillomata of the larynx in adults	563
233-235. Fibromata of the larynx	563
236-239. Cysts of the larynx	564
240. Myxoma of the larynx	564
241. Angioma of the larynx	564
242. Mackenzie's laryngeal forceps	566
243. Watson Williams' laryngeal forceps	567
244. Killian's tube with Paterson's forceps	572
245-247. Intrinsic laryngeal epitheliomata	576
248-252. Extrinsic malignant growths of the larynx	577
253. Piece of bone impacted in larynx	592
254. Congenital web of the larynx	596



THE UPPER RESPIRATORY TRACT

SECTION I

GENERAL

CHAPTER I

METHODS OF EXAMINATION OF THE UPPER RESPIRATORY TRACT

A. GENERAL CONSIDERATIONS: The Seat—The Light—The Frontal Mirror, &c.—B. EXAMINATION OF THE NOSE: External Parts—Anterior Rhinoscopy.—C. EXAMINATION OF THE MOUTH.—D. EXAMINATION OF THE PHARYNX.—E. EXAMINATION OF THE NASO-PHARYNX: Posterior Rhinoscopy—Digital Examination.—F. EXAMINATION OF THE LARYNX: Structures seen—Laryngoscopy—Other Methods—Laryngoscopy in Children.

Too much stress cannot be laid upon the importance of systematically examining (1) the nose, (2) the post-nasal space, (3) the pharynx, and (4) the larynx, in every case of disease of the upper respiratory tract, no matter to which region the subjective symptoms of the patient may point. If this is not done much time may be wasted in treating a secondary condition, whilst the primary trouble is left untouched. For example, it would be futile to treat a chronic laryngitis, whilst the nose remained blocked with hypertrophic swellings or full of muco-purulent secretions. In this chapter some suggestions will be given as to the method of carrying out such a systematic examination effectively, but the necessary dexterity can only be acquired by continued practice.

A. GENERAL CONSIDERATIONS

The Patient's Chair should be firm and heavy, so that it cannot be easily tipped up or otherwise moved. Its back should be straight and high to encourage the patient to sit upright, and to prevent the head being thrown back during examination or operation (Fig. 5).

The Surgeon's Seat should be adjustable, so that it can be raised or lowered according to the patient's height. An ordinary music stool answers very well. The height of the stool should be

so arranged that the surgeon's eyes will be about two inches lower than those of his patient, that is, about on a level with the patient's mouth. The patient should sit straight in the chair with knees together and the body slightly leaning forward, so that the movements of the head may not be hampered during examination by the back of the chair (Fig. 5).

The Light.—Artificial light is always necessary, and, where possible, is best obtained from a frosted electric lamp of 32 candle-power, in front of which a bull's-eye condenser is placed. This lamp is swung either on a standard or an adjustable wall bracket (Fig. 1). When a specially brilliant light is required for any particular purpose, the Nernst electric burner may be

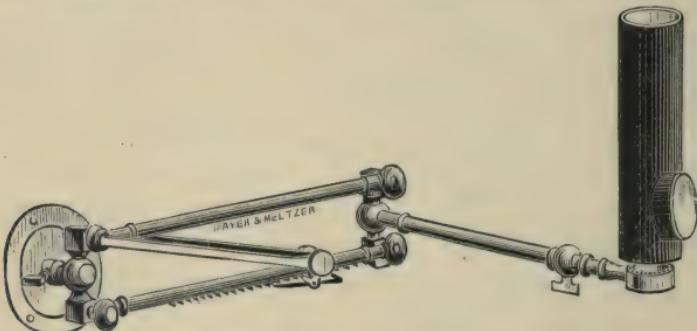


FIG. 1.—Mackenzie's wall bracket, for gas or electric light.

employed, but it is too powerful for constant use. To be ready for all contingencies the lamp for this burner and an ordinary electric lamp can be attached by a cross-bar to one standard in such a way that they are easily reversible at a moment's notice (Fig. 2). To get the full effect of the light the room should be darkened. Where electric light is not obtainable, an incandescent or argand gas burner may be substituted, or, if there is no gas supply, an oil lamp. For use in the patient's home, Baber's portable incandescent lamp (Fig. 3) is very satisfactory.

Position of the Light.—The lamp should be placed about six inches to the left of, and slightly behind the patient's head on the level of his ear (Fig. 5). This is the usual position in England, though on the Continent it is more often placed on the patient's right, which has the advantage of enabling the surgeon to operate with the right hand without any chance of the light being intercepted.

The Frontal Mirror.—The light is reflected from its source into the cavity to be examined by means of the frontal mirror

(Fig. 4), which may be held in position either by a band of some inelastic material fastened with a buckle round the head, or by means of spectacle frames. If it has to be worn for some time continuously, the head band is preferable. The spectacle frame should be made to measure and be worn only by its owner.

The mirror itself should be lightly constructed, round, with a diameter of $3\frac{1}{2}$ inches, and concave, with a focal length of 14 inches, and should have a large oval aper-

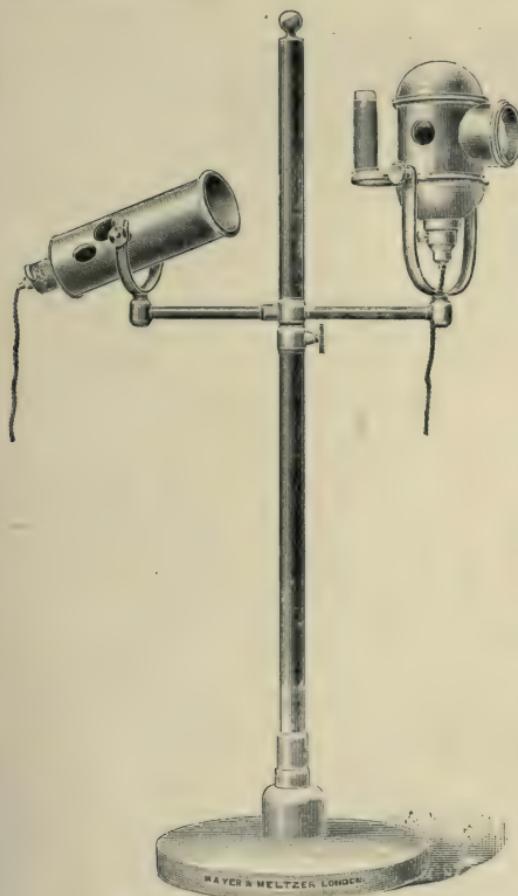


FIG. 2.—The author's combined lamp.



FIG. 3.—Baber's portable lamp.

ture in its centre. It is fixed into the carrier by means of a ball-and-socket joint, so that during the examination the central aperture can be adjusted in front of the eye, and afterwards the mirror can be turned up over the forehead.

Adjustment of the Light.—The mirror should be worn over the eye on the side on which the light is placed, that is, in England, over the surgeon's right eye. The light, the frontal mirror, and the patient are then so arranged in relation to each other that

the part to be examined is in the direct median line of the rays reflected from the frontal mirror (Fig. 5). To focus the light and keep it concentrated on the part under examination requires a little practice. It may be necessary to adjust the lamp on its stand and the head-mirror in its ball-and-socket joint, but

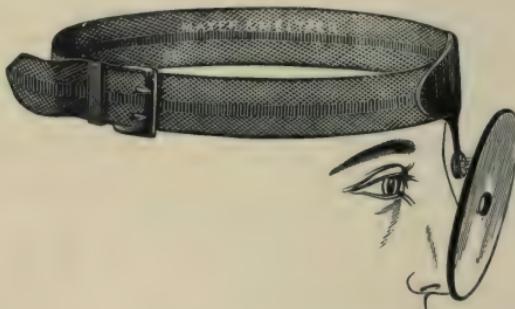


FIG. 4.—The frontal mirror.

the central aperture of the mirror must always be kept in front of the centre of the surgeon's eye. A few surgeons prefer to wear the mirror over the forehead. This is objectionable, because the surgeon's eyes are exposed to the glare of the lamp, and the patient's upper teeth will in many cases intercept some of the light. Having obtained a good concentration of light, the actual examination must be commenced.

B. EXAMINATION OF THE NOSE

The *exterior* of the nose and the surrounding parts of the face must first be observed. Evidence of mouth breathing, the shape of the mouth and lips, the position of the front teeth, the shape of the nose, collapse or expansion of the alæ nasi, broadening or thickening of the bridge of the nose, bulging over any of the accessory sinuses, and the presence of excoriations, eczema, or discharge about the nasal vestibules and upper lip, must all be looked for and noted. The patency and efficiency of the nostrils should be tested by making the patient close the mouth and breathe quietly through the nose, in the first instance with both nostrils open, and afterwards with one and then the other closed. In doubtful cases, it should be observed whether the patient can keep the mouth shut during and immediately after taking some

form of exercise, such as rapid movements of the arms. Finally, useful information may sometimes be gained by examining the



FIG. 5.—Showing a suitable chair for the patient, and the relative position of the surgeon, the patient, and the light.

superficial parts of the eyes. The signs of past or present interstitial keratitis, for instance, may throw much light on some cases, and the inequality or fixation of the pupils on others.

Anterior Rhinoscopy.—In order to obtain a view of the interior of the nose a speculum is necessary, Thudichum's (Fig. 6)



FIG. 6.—Thudichum's speculum.



FIG. 7.—Browne's speculum.

being perhaps the most generally useful, though Browne's (Fig. 7) is almost equally good. In very young children a large-sized



FIG. 8.—Ear speculum.

Gruber's ear speculum (Fig. 8) is the handiest instrument. Thudichum's speculum is introduced in the following manner: The patient's head being erect, the speculum is taken in the left hand and suspended on the forefinger, the back of the hand being towards the patient's face, and the blades of the speculum being



FIG. 9.—Method of holding Thudichum's speculum.

directed towards the nose. The blades are pressed together with the second and third fingers (Fig. 9) and gently inserted into the

nostril to be examined, taking care that they do not pass beyond the true skin of the vestibule on to the mucous membrane, for if they do pain will be caused. When in position, the blades are allowed to open again, and the second finger is placed on the bridge of the nose (Fig. 10). The tip of the nose is now slightly raised by pulling on the speculum, and then by flexing the head gently the floor of the nose, the inferior meatus, and the lower turbinal are brought into view. A brief description of the anatomy of the nasal cavities is given on pages 146 to 150, and



FIG. 10.—Thudichum's speculum in position.

the outer wall with the three turbinals is well shown in Figs. 122 and 123, and the septum nasi in Fig. 151. In a normal nose the anterior end and about the anterior third of the inferior turbinal can be seen, while the floor and septum can be traced back along the inferior meatus to about the same extent. With the speculum in the nostrils and the second finger on the bridge of the nose it is possible to move the head into any desired position, and by tilting it gradually backwards the septum can be traced up from the lower to the middle and even to the upper meatus, and the middle turbinal can be inspected. In a healthy nose the anterior end and a little of the under surface of the middle turbinal

can generally be seen. The superior turbinal cannot be seen in a normal nose. When the nasal cavities are abnormally patent, or after cocaine has been applied, it is sometimes possible to see as far back as the arches of the posterior choanae and the posterior wall of the pharynx. The latter can be recognised by making the patient swallow, when the action of the superior constrictors can be observed.

During this inspection it must be noticed whether any swelling or oedema of the turbinals is present, whether there are any hyperplastic growths, polypi, or granulation tissue, and whether any ulceration or discharge is present. If any such abnormalities exist they must be further investigated. Should there be swelling of the anterior part of the inferior turbinal, the middle meatus may be entirely hidden, and it will be necessary to apply some of the solution of cocaine and supra-renal extract (p. 64) for ten minutes to contract the mucous membrane before a satisfactory view can be obtained. Occasionally the deeper parts of the nose may be brought under inspection by the use of Killian's long-bladed speculum (Fig. 11). The nasal cavity must first be anaesthetised and then the speculum is gently introduced first between the inferior turbinal and the septum, and secondly between the middle turbinal and the septum, the blades being afterwards gradually opened till a view can be obtained.

As much information as possible having been obtained by these methods of inspection, any abnormalities should next be investigated with a probe, which for intra-nasal use should be straight or mounted in a handle at an angle of about 60° , or as shown in Fig. 12, and it should be made of flexible metal.

The consistency of swellings can be thus determined, the existence of necrosed bone ascertained, and general characteristics of growths made out.

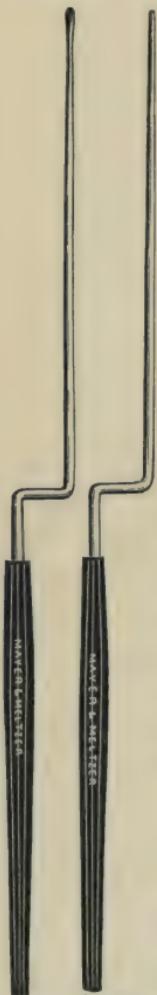


FIG. 12.—Nasal probe. Nasal wool carrier.

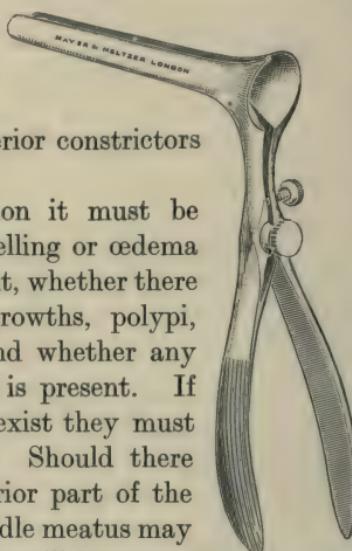


FIG. 11.—Killian's nasal speculum.

If discharge is present, its character and source must be determined. It may be mucous, muco-purulent, or purulent: mucus is colourless and viscid, pus is fluid, cream-coloured, and opaque, whilst muco-pus is yellowish-white, semi-translucent, and viscid.

When the discharge is purulent it may be seen in the region of the middle turbinate or on the floor of the nose, and it may be quickly replaced on being wiped away. Under these circumstances disease of the accessory sinuses must be suspected (Chap. x. p. 263). In other cases the pus may cover an ulcer due to syphilis, tubercle, or malignant disease, or it may be the result of purulent or atrophic rhinitis. Mucus and muco-pus are generally due to an unhealthy condition of the whole mucous membrane of the nasal fossæ. Finally, the discharge may have dried into large crusts, and it will be necessary to cleanse the nasal cavities by means of syringing before a thorough examination can be completed (p. 29).

C. EXAMINATION OF THE MOUTH

The light should now be concentrated on the mouth, the examination of which will often afford helpful diagnostic clues to diseases of the upper respiratory tract. The shape of the jaws and of the arch of the palate, the position and condition of the teeth, the state of the tongue, the presence or absence of ulcerations, mucous patches, false membranes or rashes, and the existence of perforations of the palate, should be observed.

D. EXAMINATION OF THE PHARYNX

In examining the pharynx, naso-pharynx, and larynx, it is of the utmost consequence to get the entire confidence of the patient and to avoid alarming him. This is best accomplished by carefully explaining what is about to be done, what the various instruments are intended for, and what it is necessary for him to do on his part. If the patient is nervous, one or two pretence examinations should be made without actually trying to see the part; the instruments should be introduced at first only for a moment, then for a little longer, and so on until they can be tolerated comfortably. When the patient is satisfied that he is not going to be hurt, his attention may be diverted from

the examination by quietly talking to him about some subject far removed from the matter in hand. An extra ten minutes thus spent at the outset well repays the examiner, whereas, if the inspection is commenced with any show of hurry or roughness, a much longer time may be wasted, and often without any good result. In very difficult cases it may be necessary partially to anaesthetise the soft palate and uvula with a 5 per cent. or 10 per cent. solution of cocaine (p. 65).

Pharyngoscopy.—In order to get a satisfactory view of the pharynx it is necessary to depress the tongue. The best instrument for this purpose is Lack's tongue depressor (Fig. 13), though some prefer Fränkel's (Fig. 14). Both these instru-

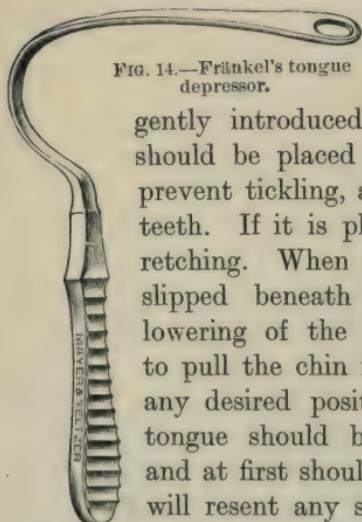
ments, however, have narrow blades, and occasionally a very soft and flabby tongue will curl round them and hide the view. It is therefore necessary to have at hand a broad-bladed spatula, such as that shown in Fig. 15. The patient should be directed to open his mouth comfortably to himself, but not widely enough to induce straining, and then to breathe quietly in and out through the mouth, without previously filling the chest. If there is any tendency to straining or retching, short rapid breaths will often counteract it. When the mouth is opened, the light is thrown on to the back of the

FIG. 31.—
Lack's tongue
depressor.

pharynx, and the tongue depressor, held firmly in the hand with the thumb supporting it behind, is

gently introduced. The distal end of the depressor should be placed on the tongue, sufficiently firmly to prevent tickling, at a point about two inches from the teeth. If it is placed too far back, it at once excites retching. When in position the forefinger should be slipped beneath the patient's chin, which prevents lowering of the head and also enables the surgeon to pull the chin forward and to move the head into any desired position (Fig. 16). The pressure on the tongue should be directed downwards and forwards and at first should be steady but gentle, for the tongue will resent any sudden or rough manipulation. Later it may be gradually increased until a satisfactory view is obtained. The condition of the parts is then carefully

FIG. 14.—Fränkel's tongue
depressor.



observed and if necessary examined with a probe, by which means it is often possible to obtain additional and useful information. (The normal pharynx is well shown in Fig. 195, p. 449). The

uvula, soft palate, the anterior and posterior palatine arches, the tonsils, supraventricular fossæ, and the posterior and lateral walls

FIG. 15.—The author's tongue depressor.

of the pharynx should all come under observation, and finally the patient should be made to say "ah," so that it may be seen whether the palate moves actively and equally on both sides. Before completing the examination it is well to make the patient retch, as by this means the lateral walls of the pharynx can be better seen, and the exact size of the tonsils can be more accurately ascertained. This, however, should generally be postponed until after the inspection of the post-nasal space and larynx for fear of making the parts irritable, whilst in any case the patient should be given a few moments' rest before proceeding with the examination.

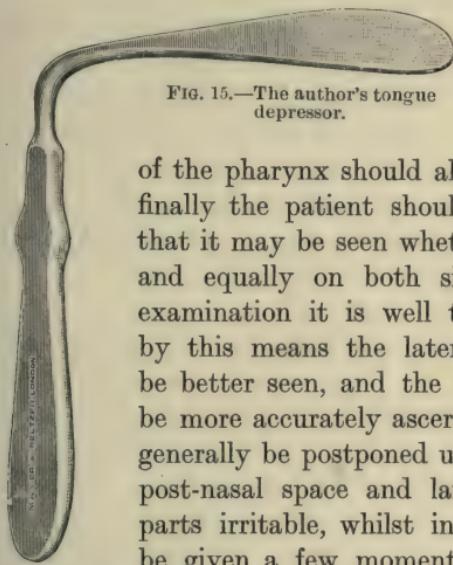


FIG. 16.—Method of using a tongue depressor.

If tumours or ulceration exist in the pharynx or at the base of the tongue, much useful information may be gained by digital examination, which may sometimes be aided by gently holding the tongue out of the mouth.

To obtain a view of the pharynx in young children, gentleness and skill are sometimes of no avail, and it may be necessary to resort to force. If the patient absolutely refuses to open his mouth, he must be held by an assistant and the nose pinched.



FIG. 17.—Post-nasal mirror.

In a very short time the child will open his mouth in order to obtain air, when the tongue depressor must be quickly slipped into the mouth and the pharynx examined.

E. EXAMINATION OF THE NASO-PHARYNX

Posterior Rhinoscopy.—The instruments necessary to obtain a satisfactory view of the post-nasal space are a tongue depressor and a small-sized, suitably bent laryngeal mirror (Fig. 17). Michael's special mirror (Fig. 18) may be used, but it is not at all necessary, and is more difficult to keep clean. The size of the mirror selected must vary with the conformation of the pharynx. It may be possible to introduce one of the larger mirrors into a large roomy pharynx with a dependent soft palate, and this should be done when possible, for the view obtained will be better and brighter. The reflecting surface of the mirror must always be warmed. If electric light is being used, this is best done by heating it over a spirit-lamp (Fig. 19) or by dipping it into hot water, whilst if gas is being used the mirror can be held over the flame till the resulting cloud of moisture has just disappeared. The temperature of the mirror should always be tested on the back of the surgeon's hand before being introduced into the patient's mouth. This precaution is especially necessary when the pharynx has been rendered anæsthetic by the use of cocaine, for then a nasty burn may be caused without complaint at the moment by the patient. Heating the back of the mirror quickly destroys the silvering; moreover, the back gets overheated before the reflecting surface is sufficiently warmed.

Everything being ready, the first step is to obtain a thoroughly good view of the pharynx. Unless the free border of the palate and uvula and the posterior wall of the pharynx can be seen, it will be impossible to see the post-nasal space. The patient is therefore instructed to open the mouth and breathe quietly, the tongue is depressed with the surgeon's left hand in the manner just described until the pharynx is clearly seen, and the mirror is introduced. When the oro-pharynx is roomy and easily seen, the

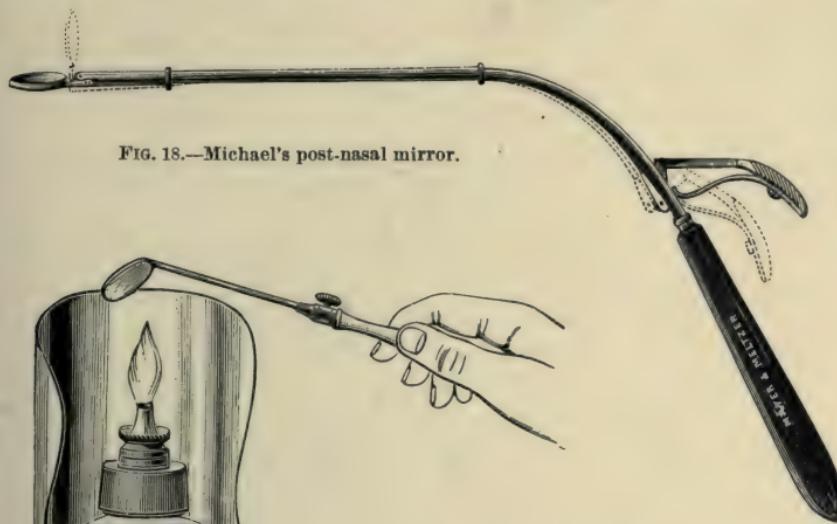


FIG. 18.—Michael's post-nasal mirror.

mirror is passed behind the soft palate and held there suspended in mid-air, great care being exercised not to allow it to come into

contact with any of the surrounding structures. By altering the angle of the mirror and by turning it first to one side and then to the other the various parts of the naso-pharynx can be brought into view. If, however, owing to lack of room or to the tendency of the soft palate to retract, it is impossible thus to obtain a view, the mirror, held tightly in the right hand, should be placed steadily and firmly on the tongue just behind the end of the depressor in such a way that the reflecting surface is below and behind the soft palate, great care being taken not to touch any of the surrounding parts (Fig. 20). If there is any hesitation about placing the mirror, or if an attempt is made to do it too gently, tickling will

result and retching will inevitably follow. The mirror being in position, the tongue is used as a fulcrum on which to move it

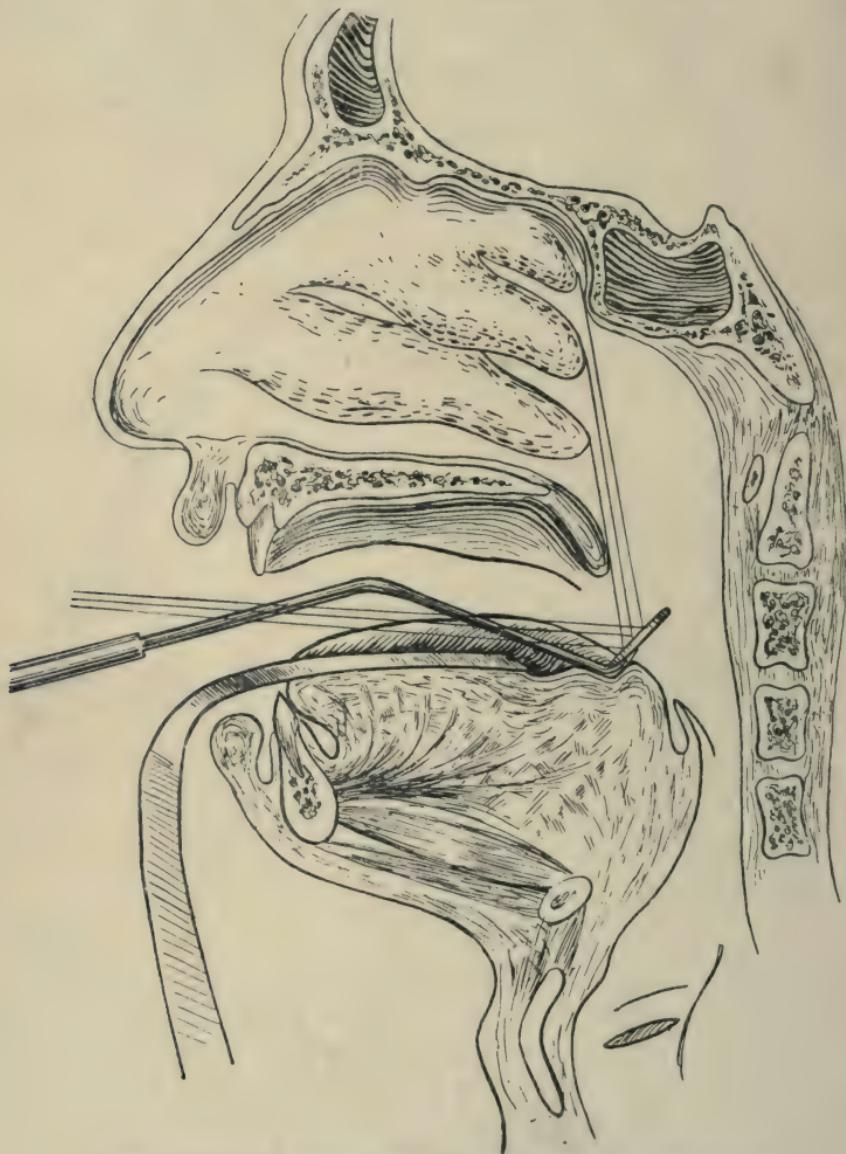


FIG. 20.—Method of obtaining a view of the naso-pharynx in difficult cases.

about, so as to bring the various parts of the naso-pharynx into view (Fig. 21). The handle of the mirror must be kept out of the line of vision by holding it slightly towards the surgeon's right.

The septum should first be found and traced upwards to the

vault, and the angle formed between them is carefully observed, as it is here that adenoid hypertrophy is most often met with. Adenoids obliterate this angle and hide the upper part of the septum from view. The vault is then followed backwards and carefully examined to determine whether post-nasal catarrh, new growths, post-nasal polypi, ulcerations, or pus, are present. The mirror is then turned sideways to examine the orifices of the Eustachian tubes. The septum must next again be sought and traced downwards, during which, by turning the mirror a little first to one side and then to the other, the superior, middle, and

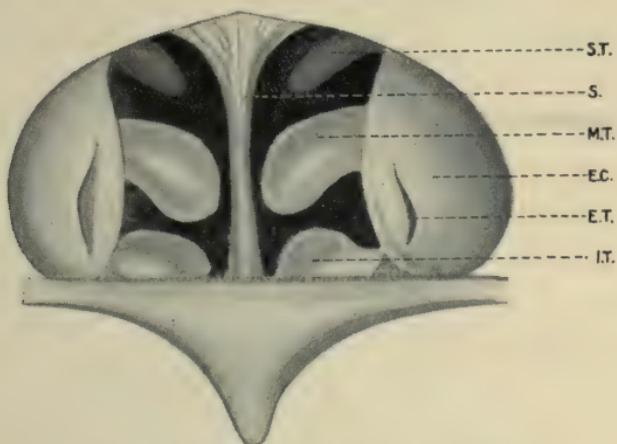


FIG. 21.—Normal appearances of the naso-pharynx.

S.T. Superior Turbinal.	E.C. Eustachian Cushion.
S. Septum.	E.T. Eustachian Tube.
M.T. Middle Turbinal.	I.T. Inferior Turbinal.

inferior turbinated bodies can be brought into view and their condition observed. Finally, an attempt should be made to see the upper surface of the soft palate, for it may be the seat of infiltrations or ulceration, although no trace of them can be seen from the front.

The mirror should not be retained in position too long at one time, but should be frequently removed and re-introduced, until the examination is completed, especially if there is any tendency to retching. If the patient raises the soft palate, he should be told to try and breathe through the nose. This effort will be accompanied by raising of the tongue, so that the pressure of the tongue depressor must be increased to meet it. If this is not successful, saying "ah," holding the breath, or taking short, rapid, and noiseless breaths through the mouth may have the

desired effect of bringing the palate forward. To examine the post-nasal space systematically is generally harder than to examine any other part of the upper respiratory tract, and requires much patience, and often, repeated trials. In young children and irritable subjects it is sometimes impossible. In adults under these circumstances the pharynx should be painted with a 5 per cent. solution of cocaine and the attempt repeated; should it be still unsuccessful and should it be very important to obtain a view, a White's self-retaining palate hook may be introduced (Fig. 22).

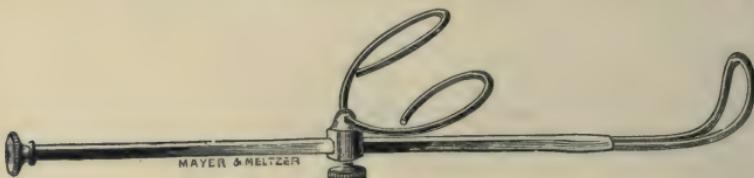


FIG. 22.—White's palate hook.

If there is no particular hurry, an effort may be made to train the patient to show the naso-pharynx. After one or two sittings a satisfactory view can generally be obtained.

Digital Examination of the Naso-Pharynx.—In children, if the post-nasal space cannot be seen, and in adults, when a growth has been discovered by the use of a mirror, it may be advisable and sometimes necessary to make a digital examination. By this means the existence and size of adenoid hypertrophies or other forms of growth can be ascertained, and the consistency and attachment of the latter can be determined. It is carried out in the following manner: The patient is instructed to open his mouth widely, and the surgeon, standing on the right side, passes his left arm over the patient's head, and with the left forefinger presses the cheek between the teeth (Fig. 23). The right forefinger is then passed along the right side of the patient's mouth over the tonsil until it impinges on the posterior wall of the pharynx, when it is quickly turned upwards and swept behind the soft palate. It is next passed forward following the line of the nasopharyngeal vault until it reaches the posterior end of the septum nasi. Adenoids can be detected and their size estimated by pressing the finger firmly upwards and backwards and moving it from side to side, and the position and attachment of a tumour can be ascertained by determining its relationship to the septum, the posterior choanæ, and vault.

If the finger is passed straight up through the centre of the mouth it is extremely likely to impinge on the soft palate, which will at once contract, making it impossible to gain access to the



FIG. 23.—Method of making a digital examination of the naso-pharynx.

post-nasal space, at any rate without using undue force. Digital examination must, of course, be postponed until the larynx has been inspected.

F. EXAMINATION OF THE LARYNX

This should include the examination of all those parts best seen by the use of the laryngoscopic mirror, namely, the base of the tongue, the lower part of the pharynx, the larynx, and the trachea.

Structures seen with a Laryngoscope.—On the *base of the tongue* the semicircular row of circumvallate papillæ can be seen, and immediately behind the central papilla a depression, the foramen cæcum, which is occasionally patent and leads to the ductus lingualis or the upper part of an unobliterated thyro-glossal duct. On either side of the base of the tongue behind the circumvallate papillæ there are numerous mucous glands and lymphoid follicles. These latter are often massed together, and attain considerable size, and are then called the lingual tonsils. A central and two lateral folds of mucous membrane—the glosso-epiglottic folds—connect the epiglottis with the base of the tongue. Between the central and each lateral fold is a depression, the right and left vallecula.

The Larynx.—The rima glottidis, or the narrow opening between the vocal cords, divides the larynx into an upper and lower compartment. The upper compartment or supra-glottic region communicates above with the pharynx, and within it are situated the ventricles and the ventricular bands or false cords, which lie immediately above the true cords. The lower compartment joins on to the trachea below. The upper aperture of the larynx is triangular in shape when open, the base formed by the epiglottis being situated anteriorly. The apex is formed by the arytenoids surmounted by the cartilages of Santorini, and the sides by the aryteno-epiglottidean folds or ligaments.

The epiglottis is a cartilaginous structure covered by a thin layer of mucous membrane, which is tinged with yellow, owing to the underlying cartilage. The upper portion is free and generally projects upwards behind the base of the tongue, though it may be curved backwards, and hang over the upper aperture of the larynx, thus rendering the lower parts more difficult to see by means of the laryngoscope. Occasionally it may be twisted, giving



FIG. 24.—Twisted epiglottis.

a distorted appearance to the image of the larynx in the mirror (Fig. 24). The lower portion tapers off into the thyro-epiglottic ligament, a narrow elastic band, which is attached to the angular depression between the alæ of the thyroid. The lateral borders of the cartilage, though free above, are enveloped below in the aryteno-epiglottidean folds. On the posterior surface there is a convexity immediately above the anterior extremities of the vocal cords, which is called the cushion of the epiglottis.

The aryteno-epiglottidean ligaments are two folds of mucous membrane, which pass from the sides of the epiglottis obliquely downwards, backwards, and inwards to the tips of the arytenoids, and enclose ligamentous and muscular bands, and the cartilages of Wrisberg.

The arytenoid cartilages, two in number, are irregularly shaped pyramids each with three surfaces, the inferior of which articulate with the cricoid cartilage, on which the arytenoids rotate during inspiration and phonation, and thus lead to opening and closing of the glottis. The apices of the cartilages project upwards behind the glottis, curve backwards and inwards, and articulate with the cartilages of Santorini.

The vocal cords appear as two yellowish-white bands stretching across the larynx in an antero-posterior direction, and are more or less overlapped by the ventricular bands. They are essentially the ligamentous portions of the thyro-arytenoid muscles, and are prismatic in shape, the base of the prism being upwards and the inner surface sloping downwards and outwards. They are attached in front to the angle of the thyroid cartilage, and behind partly to the vocal processes of the arytenoids and partly to the anterior surfaces of those cartilages. A yellowish spot, which is sometimes almost an elevation, can be seen at the junction of the posterior with the middle thirds of the cords, and indicates the attachment of some fibres of the vocal ligaments to the tips of the vocal processes of the arytenoids. The cords are covered by a very thin and closely adherent mucous membrane.

The inter-arytenoid commissure is the space between the two arytenoid cartilages, and is only seen during respiration. During phonation it is entirely obliterated by the approximation of the arytenoids. The space is occupied by the arytenoideus muscle covered with mucous membrane.

The ventricular bands, sometimes called the false cords, are prominent rounded folds of mucous membrane containing numerous mucous glands. They stretch across the larynx in an antero-posterior direction immediately above the true cords, but being farther apart allow the latter to be seen below them.

The ventricles of the larynx are two pouches situated beneath and to the outer sides of the ventricular bands. They are lined by mucous membrane richly supplied with small mucous glands. Their openings are narrower than the pouches themselves, and can generally be clearly seen with the laryngoscope as dark lines

between the ventricular bands and the cords. The anterior part of each ventricle is often continued upwards for a considerable distance, sometimes reaching as high as the upper border of the thyroid cartilage.

The subglottic region is very narrow immediately below the cords, but quickly widens out and in the cricoid region assumes

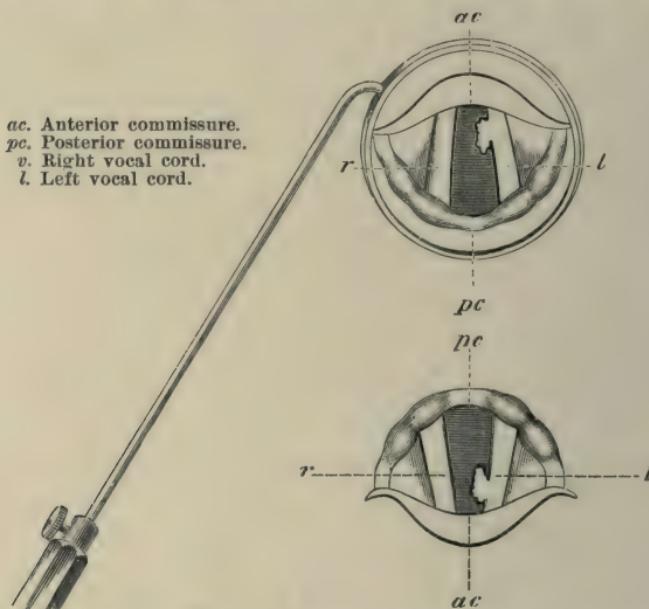


FIG. 25.—Showing inversion of the image in the laryngeal mirror.

the calibre of the trachea. During deep inspiration the anterior portion of two or three rings of the trachea can usually be seen. Occasionally the trachea can be traced down to its bifurcation.

The lower part of the pharynx, sometimes called the laryngopharynx, is situated behind the larynx and extends to the level of the lower border of the cricoid cartilage, where it is continuous with the oesophagus. Its posterior wall can be clearly seen by the laryngoscope as far down as the arytenoids, where the anterior and posterior walls come into contact with each other. The anterior wall is chiefly occupied by the upper opening of the larynx, on either side of which a longitudinal depression, called the *sinus pyriformis*, can be seen. These depressions are bounded externally by the inner surfaces of the alae of the thyroid and internally by the outer surfaces of the aryteno-epiglottidean folds.

Method of Examination by Laryngoscopy.—In examining the larynx it is very important to remember that the reflected image is reversed in the antero-posterior direction just as in an ordinary mirror, but that the right side remains on the right and the left on the left. (This is clearly explained by Fig. 25.) The examination is thus carried out: The size of the tonsils having



FIG. 26.—Method of holding the patient's tongue and raising the upper lip.

been previously ascertained, a mirror is selected which can be comfortably used without coming into contact with them. With this limitation, the larger the mirror that is used, the better will be the view obtained of the lower parts. The selected mirror should be warmed over a spirit lamp (see Fig. 19, p. 13). The patient should be instructed to raise his head slightly, to open his mouth fairly wide, to protrude his tongue, and to continue breathing. The tongue is taken between the folds of a tongue cloth with the thumb and second finger of the surgeon's left hand, and held slightly upwards out of the way of the lower teeth, whilst the upper lip and moustache are raised out of the line of vision with the forefinger (Fig. 26). The mirror is held like

a pen in the right hand (Fig. 27) and introduced into the mouth, the glass surface being made to follow the curve of the tongue, until it is opposite the uvula.

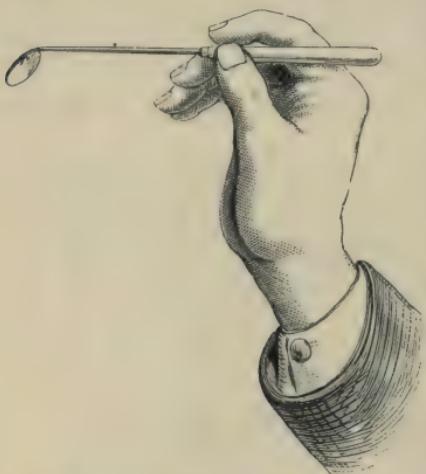


FIG. 27.—Method of holding the mirror.

It is then planted quickly and firmly on the soft palate carrying the uvula up behind it, and there it must be held with considerable and steady pressure in an upward direction. If the palate is touched with too much gentleness or in a hesitating manner, tickling followed by retching will result, and unless extreme care be taken not to touch the base of the tongue, the tonsils, and the posterior wall of the pharynx, the same result will follow. The handle of the mirror must be held out of the line of vision by pressing it against the left-hand corner of the patient's mouth. The mirror being in position, the soft palate is made a fulcrum on which to

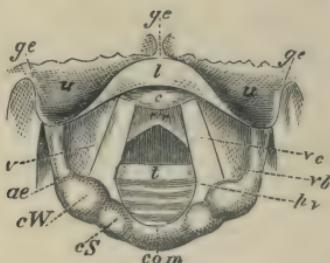


FIG. 28.—Parts as seen during quiet Inspiration (Mackenzie).

- ge. Glosso-epiglottic folds.
- u. Upper surface of Epiglottis.
- l. Lip of Epiglottis.
- c. Cushion of Epiglottis.
- v. Ventricle of Larynx.
- ae. Aryteno-epiglottidean fold.
- cW. Cartilage of Wrisberg.

- cS. Cartilage of Santorini.
- com. Arytenoid commissure.
- vc. Vocal cord.
- vb. Ventricular band.
- pv. Processus Vocalis.
- c.c. Cricoid cartilage.
- t. Trachea.

move it in any direction necessary for bringing the various regions to be examined into view (Figs. 28 and 29). First the base of the tongue should be observed and the presence of any abnormality noted, then by tilting the mirror a trifle backwards the epiglottis can be seen and examined, and by tilting it still farther the posterior wall of the pharynx can be traced down to the level of the ary-

tenoids. In some cases by a little adjustment of the mirror the whole larynx can now be seen, but in others the dependent position of the epiglottis will hide its lower part to a greater or less extent. If this be so, the patient should be instructed to say "eh," by which means the epiglottis is raised and at least the posterior third of the

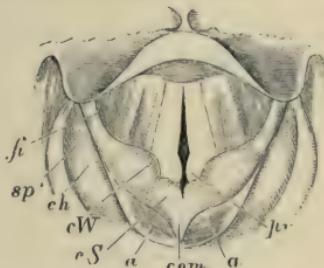


FIG. 29.—Parts as seen during Phonation (Mackenzie).

fi. Fossa Innominata.
sp. Sinus Pyriformis.
ch. Cornu of the Hyoid bone.
cW. Cartilage of Wrisberg.

cS. Cartilage of Santorini.
a. Arytenoid Cartilages.
com. Arytenoid commissure.
pv. Processus Vocalis.

larynx will be seen. If it has not yet been possible to see the anterior part, the patient should be made to say "ee" in a high-pitched voice, which raises the epiglottis to its utmost, and generally renders a good view of the whole larynx possible. Very occasionally it may be necessary to apply cocaine to the epiglottis and to hook it back with a bent probe, in which case the patient must take

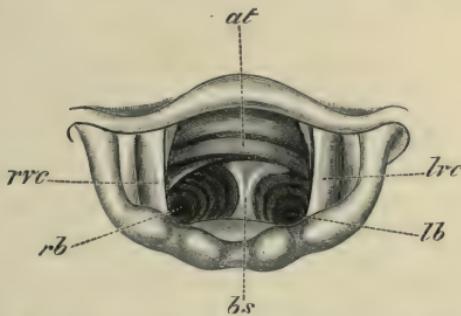


FIG. 30.—View of Anterior Wall of Trachea and Bronchi (Mackenzie).

at. Anterior wall of trachea.
rvc. Right vocal cord.
lvc. Left vocal cord.

rb. Right bronchus.
lb. Left bronchus.
bs. Bronchial spur.

charge of his own tongue. Under any circumstances the patient must be made to phonate so that the surgeon may observe the movements of the cords and determine whether they adduct and abduct normally, or whether one or both are fixed, and if so in what position. Finally the subglottic region and the trachea should be

examined. In order to do this the surgeon's head should be considerably lowered, and the patient directed to breathe deeply and freely, while the soft palate is raised as far as possible with the mirror. In this way the walls of the trachea can often be examined as far down as the bifurcation (Figs. 30 and 31).

All this cannot, of course, be done during one introduction of the mirror, which should therefore be frequently removed and the patient allowed a few moments' rest before it is again introduced. If the pharynx is irritable, the patient must be made to take short rapid breaths through the mouth, only ceasing to do so when told to phonate. With a little patience this examination can almost always be satisfactorily carried out, though very occasionally it may be necessary to cocaine the pharynx, in

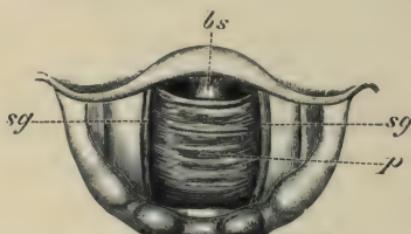


FIG. 31.—View of Posterior Wall of Trachea and Bronchi (Mackenzie).

bs. Bronchial spur.
sg. Subglottic region.
p. Posterior wall of trachea.

which case especial care must be taken not to overheat the mirror, as pointed out above. In very rare instances, even with the help of the cocaine, it is found impossible to see the larynx, and under these circumstances a course of training will be necessary. The patient must be seen frequently and on each occasion the mirror introduced a few times. After a few sittings a satisfactory examination can usually be made. It is generally found that such intolerant patients are either dyspeptic, alcoholic, or highly neurotic, and sometimes all three combined. Laryngoscopic examination will be rendered easier by suitable attention to these conditions and by making it before rather than after a meal; sucking ice for a quarter of an hour before the examination is commenced will also be found very useful.

Having completed the inspection of the interior of the larynx, further information may be gained in some cases by examination of the neck. Pain, redness, and swelling over the larynx, fixation of the parts, or the presence of enlarged glands or

tumours in the neck may throw some light on the case. Again, if a new growth or an ulcer has been discovered by the use of the laryngoscope, the diagnosis can often be materially helped by palpation with the index finger, should it be possible to reach the diseased area. Finally, in some cases examination of the interior of the larynx with a probe may be helpful in establishing a diagnosis. It is useful, for instance, in determining the attachment and consistency of a new growth, the depth of an ulcer, the existence of necrosed cartilage, and in testing the sensibility of the mucous membrane.

Other Methods of Examining the Larynx.—If disease is found at the base of the tongue it is generally possible to get a direct view of the parts in the following manner: The patient's head is bent slightly forward with the chin raised, whilst the surgeon's seat is a little heightened. A tongue depressor is introduced somewhat farther back than usual, and the tongue is steadily and firmly depressed with gradually increasing force until a view is obtained. If the epiglottis is affected the patient's head should be thrown back, the surgeon's seat raised, and the hooked end of Lack's or Kirstein's depressor passed quite to the back of the tongue, and then, by firmly depressing this organ and at the same time pulling it forward, the epiglottis can be inspected.

Kirstein has introduced a method to which he has given the name of "Autoscopy," and by which he maintains the interior of the larynx can be examined by direct vision without the use of a mirror. It is not, however, of much practical value and puts the patient to much discomfort.

Killian has recently shown that the interior of the larynx, and even of the trachea and bronchi, can be examined by passing an instrument modelled on the lines of the cystoscope into or through the larynx. It is useful for locating and even for removing foreign bodies (Chap. xxvi.), and is recommended by Waggett and others for the removal of laryngeal papillomata in children (Chap. xxv.).

Metallic foreign bodies can be detected and located by the use of "Röntgen rays." The method is useful when there is much inflammatory swelling of the larynx or when the foreign body is in the trachea or in one of the bronchi.

Laryngoscopy in Children.—The above methods are applicable in children if old enough to follow out the instructions of the surgeon, but even then they require much patience and a long course of training. In infants, however, it is generally

possible to see the larynx by following the method, first recommended by Lack, and thus described by him : " The child, wrapped up in a blanket to restrain its arms, is held in front of the surgeon, and the head is steadied by an assistant who may also hold the mouth open with a gag if necessary. A tongue depressor with a curved end is then introduced over the base of the tongue and hooked round the hyoid bone. The base of the tongue is depressed and at the same time pulled forward ; if this be done very gently it frequently excites no resistance. A small laryngeal mirror is now introduced in the ordinary way and a view of the larynx can usually be obtained. It is better to proceed very gently and not to alarm and excite resistance on the part of the infant, so as to examine the larynx under normal respiration ; if the child resist, the mirror should be held steadily in position until he is forced to take breath, when a momentary glimpse of the larynx is obtainable. By this method, with one or two trials on different occasions if necessary, a good view can always be obtained."

Occasionally this method fails, and then if there is urgent necessity to see the larynx, a general anaesthetic should be administered. If laryngeal obstruction exist, this is a dangerous proceeding, and tracheotomy instruments must be in readiness. The degree of general anaesthesia necessary may be diminished and the abolition of the reflexes encouraged by painting the pharynx and, if necessary, the larynx with a 4 per cent. solution of cocaine (p. 65). This, however, must be done with great caution, as infants are extremely susceptible to the poisonous effects of this drug. The method of examination is the same as without an anaesthetic, but the mouth will have to be held open with a gag. Sometimes it is easier to get a view if the tongue be drawn out of the mouth instead of using the tongue depressor, and occasionally it may be necessary to combine both methods in order to get the base of the tongue out of the line of vision. Having obtained a view, any abnormality which may be present should be dealt with.

G. FURTHER POINTS TO BE OBSERVED

In doubtful cases collateral evidence must be sought in support of the most probable diagnosis. For instance, certain inflammatory conditions of the pharynx may suggest scarlet fever or measles,

in which case a careful search must be made for the rashes characteristic of these fevers. In other cases secondary syphilis may be suspected, when a chancre or secondary rash must be looked for. Tertiary syphilis and tubercle are often responsible for infiltration and destructive ulceration of the nose, pharynx, and larynx, and in doubtful cases evidence corroborative of these diseases must be sought elsewhere. Thus the body must be searched for scars indicative of syphilis, and the chest carefully examined to determine whether there are signs of pulmonary tuberculosis. Again, enlarged glands about the angles of the jaw, or in the anterior and posterior triangles of the neck should be looked for, as their existence and character may often throw light on the case. When there is paralysis of the vocal cords, the neck and thorax must be carefully examined for tumours or aneurysms, and if nothing local can be discovered, investigations should be made to determine whether there is any lesion of the central nervous system. In other cases the condition of the stomach, liver, kidneys, or other organ must be carefully investigated before the true significance of the local changes can be appreciated, and finally the microscopical examination of secretions, membranes or sputa for various micro-organisms, or the preparation and examination of sections of a portion of a growth may be necessary before the investigation of the case can be considered complete.

CHAPTER II

METHODS OF LOCAL TREATMENT, WITH FORMULÆ

I. REMEDIES EMPLOYED BY THE SURGEON: A. *Cleansing*.—Syringing the Nose, &c.—B. *Application of the Electric Cautery*.—Methods—Dangers.—C. *Chemical Caustics*.—D. *Paints*.—E. *Insufflations*.—F. *Sprays*.—II. REMEDIES EMPLOYED BY THE PATIENT: A. *External Applications*.—B. *Collumaria*.—C. *Sprays*.—D. *Steam Inhalations*.—E. *Paints*.—F. *Gargles*.—G. *Lozenges and Pastils*.—H. *Mixtures*.

IN order to avoid repetition a short account will be given in this chapter of the various methods of local treatment, firstly as employed by the surgeon in the consulting-room, and, secondly, as employed by patients in their homes. The formulæ for the various local applications and a few mixtures for internal administration, nearly all of which are taken from the Pharmacopœia of the Throat Hospital, will be given here and only referred to hereafter.

I. REMEDIES EMPLOYED BY THE SURGEON

A. CLEANSING

The Nose.—The nasal mucous membrane is extremely sensitive and the functions of the olfactory nerve are easily destroyed. Strong antiseptics and irritants of all kinds must therefore be employed with great caution, and such remedies should never be prescribed as lotions or sprays for the patient's use. Simple cleansing, however, is often necessary in order to free the cavities of pus, muco-pus, or crusts. If the discharge is but slight in amount, it can generally be wiped away by means of pledges of cotton wool attached to a carrier (Fig. 12) or held in nasal forceps (Fig. 32), but if excessive, it is advisable before performing any operation, and sometimes as a method of treatment, to syringe the nose gently with some non-

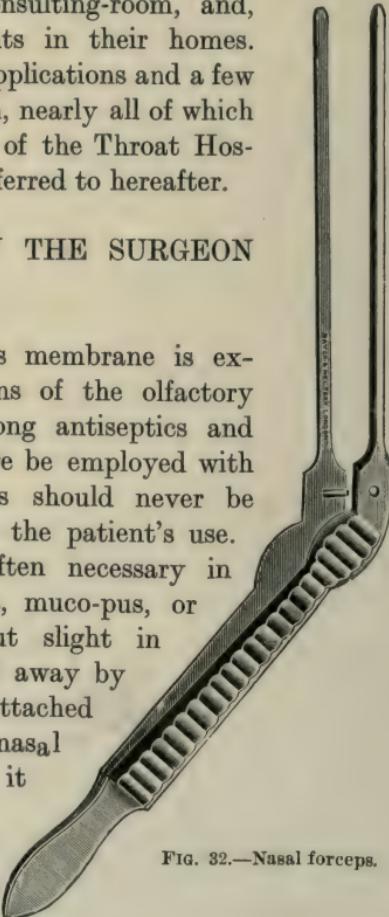


FIG. 32.—Nasal forceps.

irritant fluid. For this purpose one of the following lotions may be used :—

Collunarium Sanitas.

R.	Sanitas	30 m. = 1.87 c.c.
	Chloride of sodium	5 gr. = 0.34 gm.
	Water.	to 1 oz. = 30 c.c.

Collunarium Boro-Glyceride.

R.	Boro-glyceride	30 gr. = 2.06 gm.
	Chloride of sodium	5 gr. = 0.34 gm.
	Water.	to 1 oz. = 30 c.c.

Collunarium Alkalimum.

R.	Bicarbonate of sodium	3 gr. = 0.21 gm.
	Borax	3 gr. = 0.21 gm.
	Carbolic acid	1 gr. = 0.07 gm.
	White sugar	5 gr. = 0.34 gm.
	Water.	to 1 oz. = 30 c.c.

In atrophic rhinitis and tertiary syphilis the nose may be entirely filled with crusts adhering firmly to the mucous membrane. Before syringing it is best to loosen such crusts with per-oxide of hydrogen (10 to 20 vols.) freshly prepared. This can be applied either by means of a spray, or by saturating pledges of cotton wool with the solution and packing them into the nose against the crusts, where they should be allowed to remain for four or five minutes.

Syringing the nose should always be carried out by the surgeon himself or by a skilled nurse until the patient has acquired the habit of allowing the fluid to enter one nostril and return by the other without choking, coughing, or swallowing. The chief danger is that of acute otitis media, caused by driving some of the discharges or lotion up the Eustachian tubes. To avoid this risk the patient should be directed to bend the head and body a little forward, to open and breathe through the mouth, and to continue the breathing in spite of the temptation to choke or swallow. The surgeon on his part must try to prevent any undue pressure of fluid in the post-nasal space. If one side of the nose is obstructed, he should syringe from that side and let the fluid return by the patent nostril. The lotion should be directed along the inferior meatus with no undue force, and the stream should be very inter-

mittent until the patient has become accustomed to the procedure. The pressure on the syringe must be so regulated that the fluid can return by the nostril of exit as quickly as it is introduced into the nostril of entry.

When the patient can be trusted to use a syringe for himself, he should be provided with a small rubber one of the capacity of one ounce (Fig. 45). Nasal douches with a syphon action are dangerous, as a great and continuous pressure is produced in the post-nasal space and the fluid is extremely likely to be forced up the Eustachian tubes. Such douches therefore ought never to be used.

Cleansing the Post-Nasal Space.—Sticky secretions are very apt to cling to the mucous membrane of the naso-pharynx, causing discomfort and preventing the proper application of local remedies. It is therefore often necessary to cleanse the part thoroughly.



FIG. 33.—Post-nasal syringe.

This can generally be done by syringing through the anterior nares according to the directions just given, but sometimes the use of the post-nasal syringe (Fig. 33) is more efficacious. The distal end is introduced behind the soft palate, the head being slightly bent forward so that the fluid may run out from the nostrils. Coll. Alkalimum or Coll. Sanitas (p. 29) should be used. It may sometimes be necessary to brush the uvula and soft palate with a 5 per cent. solution of cocaine before the syringe can be easily introduced.

Cleansing the Pharynx.—A satisfactory view of the pharynx can generally be obtained without any elaborate cleansing, but in cases of ulceration it is occasionally necessary to get rid of pus or muco-pus before the full extent of the diseased area can be estimated. This is best done by first spraying the affected part with the Nebula Alkalina, and then gently wiping the surface with pledgets of cotton wool twisted on a carrier. The Nebula Alkalina is similar to the Collunarium, but considerably stronger. The pharyngeal and laryngeal mucous membrane can tolerate stronger remedies than the nose. The following is the formula:—

Nebula Alkalina.

R.	Bicarbonate of sodium	15 gr. = 1.03 gm.
	Borax	15 gr. = 1.03 gm.
	Carbolic acid	4 gr. = 0.27 gm.
	Glycerin	45 m. = 2.80 c.c.
	Water	to 1 oz. = 30 c.c.

In using sprays in the pharynx a pause should be made after every two or three compressions of the ball, so as to allow the patient to expectorate. If this precaution is not followed the fluid trickles down the throat and is likely to cause troublesome fits of coughing.

Again, when a membranous exudation is present, an attempt must be made to clear it away, in doing which some information

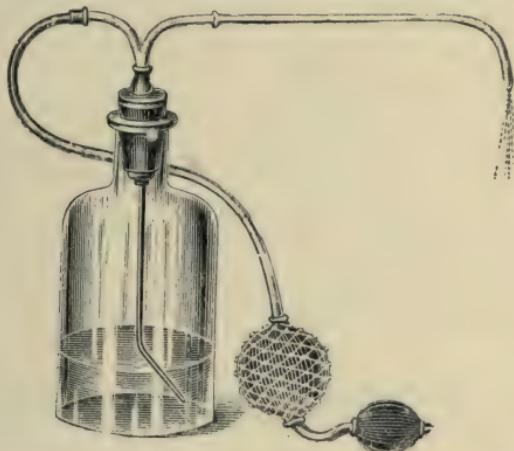


FIG. 34.—Laryngeal spray.

may be gained as to whether it is so-called "true" or "false" membrane. As a rule the former is firmly adherent, and its removal causes some haemorrhage, whilst the latter lies on the surface of the mucous membrane and can be easily wiped away, or peeled off with forceps. The more adherent the membrane, the more likely it is to be diphtheritic, but the systematic microscopical examination of membranous exudations has shown that the non-adherent variety very often contains the Klebs-Loeffler bacillus, whilst an adherent membrane may be due to other irritants.

Cleansing the Larynx.—It may be necessary to wash the larynx in order to free it from excessive purulent secretions in certain cases of tuberculous and syphilitic ulceration, or to get rid of the crusts which occur in simple, or more commonly in foetid, dry laryngitis.

Cleansing the larynx is carried out by means of a laryngeal spray (Fig. 34) containing the Nebula Alkalina (p. 31). The patient is directed to open his mouth, to hold his tongue well out with his right hand, and to continue breathing quietly and evenly in and out during the manipulations. The surgeon first introduces the laryngeal mirror with his left hand, and obtains a good view of the larynx. He then takes the spray in his right hand and with the help of the laryngeal mirror guides the distal end well over and behind the epiglottis. The next step is to raise the proximal part of the spray so that the laryngeal end points forwards and downwards in the direction of the vocal cords. The ball of the spray is now sharply compressed and quickly withdrawn so that the patient may cough and expectorate. This should be repeated three or four times, or until the larynx is cleared. If the patient is very sensitive, the palate should be anæsthetised as a preliminary measure.

B. THE APPLICATION OF THE ELECTRIC CAUTERY

The electric cautery has very greatly taken the place of chemical caustics in nasal and pharyngeal surgery, but is not often used in laryngeal work. The power for heating the wire can be obtained from a bichromate battery, an accumulator, or

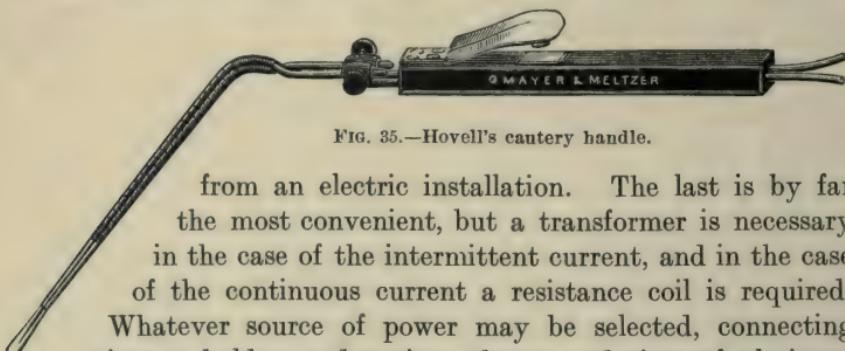


FIG. 35.—Hovell's cautery handle.

from an electric installation. The last is by far the most convenient, but a transformer is necessary in the case of the intermittent current, and in the case of the continuous current a resistance coil is required. Whatever source of power may be selected, connecting wires, a holder, and various shapes and sizes of platinum points will be necessary. The holder should have a button with which to make and break the current, so that the point can be introduced cold and applied to the exact spot before being heated, and the burning can be discontinued at any moment (Fig. 35).

Method of Application in the Nose.—The necessary apparatus being at hand and the mucous membrane having been anæsthetised (p. 63), a suitable cautery point is selected, and cleansed by being heated for about five seconds. The heat of the cautery point

should next be regulated, care being taken that the patient does not see the red-hot wire. A white heat is not advisable, as its action is too rapid and therefore difficult to control, and because it often leads to troublesome bleeding. A dull red heat is also unadvisable, because its action is too slow and the point adheres to the mucous membrane, causing pain, laceration, and bleeding on removal. The heat must therefore be regulated to bright or cherry redness. The light is then thrown on to the nose, the speculum introduced and a thoroughly good view obtained. This latter is most important, for the cautery should never be used in the nose unless its application can be watched and guided, otherwise opposing surfaces may be injured, and troublesome adhesions result. The region to be cauterised is first dried with cotton wool, so as to prevent the

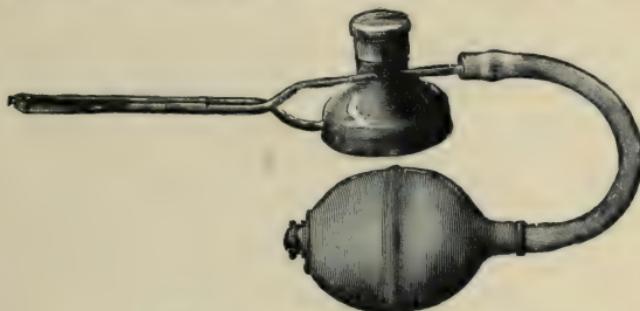


FIG. 36.—De Vilbiss metal nebuliser.

generation of steam, which might cause some scorching and inflammation round the cautery wound, and the cautery is then introduced cold and applied to the spot to be burned, and heated only when in the exact position. When sufficient burning has been done, the point should be just removed from contact with the mucous membrane before it is allowed to cool, otherwise it will adhere and some force will be required to separate it.

After using the cautery the wound should be covered with *Insufflatio Bismuthi et Morphinæ*.

Insufflatio Bismuthi et Morphinæ.

R.	Carbonate of bismuth	280 gr. = 19.20 gm.
	Acetate of morphine	8 gr. = 0.55 gm.
	Gum acacia, in fine powder	to 1 oz. = 30 gm.

This relieves any smarting or pain which may occur when the anæsthetic action of the cocaine has passed off. As an alternative to this, the wound may be protected with atomised vaselin, as suggested by Semon. Some vaselin is put into a De Vilbiss uni-

versal atomiser (Fig. 36) made of metal. The vaselin is melted by holding the receptacle over a spirit lamp, the tubes of the atomiser being also warmed in the flame, and then by adjusting the movable end piece the atomised vaselin can be sprayed on to the wounded surface. When it solidifies, it forms a thin impervious film, which affords an excellent protection to any wound. Finally the wound should be further protected from atmospheric impurities and cold by the insertion of a small piece of cotton wool into the vestibule just within the nostril, which should be worn for the first twenty-four hours. The risks of septic complications are thereby greatly diminished. On removing the wool the nose should be gently washed with alkaline lotion (p. 29) and sprayed with *Nebula Menthol* (p. 44). This should be repeated night and morning for a week.

Dangers of the Cautery.—Various troubles may arise after the use of the electric cautery in the nose. Adhesions, dry rhinitis, excessive inflammatory reaction, acute otitis media, and acute tonsillitis are the commonest, whilst cases of membranous rhinitis, conjunctivitis, erysipelas, septicæmia, and meningitis have also been reported. Meningitis has followed cauterisation of the ethmoidal region, and therefore many surgeons have entirely abandoned the application of the cautery to the middle turbinate and other parts of the ethmoid bone. It may, however, be safely employed for the purpose of counter-irritation, because for this purpose superficial searing is quite sufficient, but it must never be used for the destruction of inflammatory or hyperplastic swellings, because for that deep cauterisation is necessary, which might possibly be followed by infection of the veins passing through the cribriform plate. Seeing how many are the complications which may follow the use of the cautery, it must always be applied with care, skill, and judgment, and every possible precaution taken, both at the time and afterwards, to prevent untoward results. With the exception of adhesions and rhinitis sicca all these complications are probably due to the absorption of septic poison from the wound, though excessive inflammatory reaction may in some cases result from too extensive an application of the cautery. Adhesions are due to the direct or indirect wounding of opposing surfaces, and dry rhinitis is due either to using the cautery in unsuitable cases or to destroying too much mucous membrane. At the time of operation the risk of all these accidents can be greatly minimised by never heating the cautery

in the nose unless it is possible to see exactly what is being done, by never doing much at one sitting, and by never operating on both sides of the nose at once.

If there is any reason to fear the formation of adhesions, the patient must be seen within forty-eight hours and dealt with on the lines suggested under after-treatment of intra-nasal operations (p. 71).

Method of Application in the Naso-Pharynx.—The cautery is seldom employed in this region, but it has been recommended for reducing the size of circumscribed pads of adenoids and of enlargements of the posterior ends of the inferior turbinals. It is, however, very difficult to apply and tedious both to operator and patient, it requires many sittings, it is not free from risk, and can only be carried out in adults. It cannot therefore be recommended.

Method of Application in the Pharynx.—No particular general directions are needed for the application of the electric cautery to the pharynx. The spot to be burned is cocainised (p. 64) and the application is made under a good illumination. The intensity of heat should be a little greater than when employed in the nose, for more tissue having, as a rule, to be destroyed, the cautery point is apt to become coated with ash and stick fast if too little heat is used.

Method of Application in the Larynx.—The use of the electric cautery in the larynx is always attended with considerable risk of acute traumatic oedema, leading occasionally to dangerous dyspnoea; it is not therefore to be recommended lightly. When used, extremely little must be done at one sitting and the patient should be kept under strict observation for forty-eight hours afterwards. It is first necessary to anæsthetise the parts (p. 65), and it is absolutely essential that a perfect view of the larynx should be obtained, so that the cautery may be accurately applied to the diseased area and to that only, and so that its action can be carefully watched and limited. For the method of introducing the instrument see p. 67.

C. CHEMICAL CAUSTICS

Although in the nose and pharynx the electric cautery has greatly taken the place of chemical caustics, the latter are still of service, not only when the cautery is unobtainable, but also for the destruction of granulations, the cauterisation of ulcers, and sometimes for the reduction of hyperplastic swellings. In the larynx they are to be preferred for nearly all purposes.

In the Nose.—The following chemical caustics are useful: Chromic acid, trichloracetic acid, nitric acid, nitrate of silver, the solution of acid nitrate of mercury, and lactic acid.

Chromic Acid is the most generally useful of these, being an excellent substitute for the galvano-cautery and in some cases preferable to it, because its after effects are less painful and it produces less inflammatory reaction. It may be applied dry, the crystals being fused on a probe, or as a saturated solution. To fuse the crystals, the probe is first heated over a spirit lamp and then dipped into the crystals, two or three of which will adhere to it. These are slowly melted over the flame and then withdrawn and allowed to cool. This must be done gradually and carefully without the use of too much heat, otherwise the crystals will be converted into a black ash having no caustic properties. If a saturated solution is used, it is applied on a capillary probe (Fig. 37) or by means of a thin layer of cotton wool twisted on a very fine carrier. Before the application is made the part



FIG. 37.—Woakes' carrier.

to be cauterised should be rendered anaesthetic (p. 63) and then dried with pledges of absorbent wool so as to prevent the acid running. After the application, the excess of acid should be wiped away with mops of cotton wool and a solution of bicarbonate of soda (30 grs. to the ounce) applied to neutralise any free acid which may be left behind. This precaution is necessary because chromic acid poisoning has been known to occur and even to end fatally. The symptoms are severe vomiting, diarrhoea, and collapse.

The after-treatment consists in keeping the nose clean and in guarding against adhesions. It is well to protect the wounded surface by inserting some wool in the nasal vestibule for the first twenty-four hours.

Nitric Acid must be very carefully employed, as its action extends beyond the seat of original application and thus more destruction than is intended may take place. The pure acid is best applied on a thin glass rod with a roughened surface.

Trichloracetic Acid has been employed for the destruction of unhealthy granulations, but is not very serviceable. It is applied by means of a pledge of cotton wool on a fine probe.

Nitrate of Silver is not often employed within the nasal

cavities, but is useful for fissures about the alæ and vestibula of the nose. In the upper air passages the safest method of applying it is to fuse the salt on a probe. A few crystals are gently melted in a porcelain crucible over a spirit lamp, a slender silver probe is dipped in and withdrawn, carrying on its bulbous end a drop of the melted salt; this is allowed to solidify and is then ready for use.

The Acid Nitrate of Mercury Solution is beneficial as an application to the granulations springing up round syphilitic necrosis. It was once extensively employed for this purpose, but it is better to remove the necrosed bone as soon as possible and to curette the surrounding unhealthy tissues. It is best applied on fine orange-wood sticks.

Lactic Acid is chiefly employed for tuberculous ulcers. It is applied by means of pledgets of cotton wool on a carrier, and should be well rubbed into the diseased area.

In the Pharynx.—Before the introduction of the galvanocautery, *London paste* was frequently recommended for the reduction of hyperplastic swellings, but it is now seldom used. It is made by reducing equal parts of caustic soda and unslaked lime to a fine powder in a warm mortar and mixing them intimately together. This is kept in a well-closed bottle, and when required for use, a little of it is mixed with just sufficient water to form a paste, with which a probe or pointed orange-wood stick can be coated and applied to the part to be destroyed.

Various *chemical caustics* are, however, useful for cauterising mucous patches or the surface of ulcers. Those chiefly employed are nitrate of silver, chromic acid, lactic acid, and nitric acid. As a rule it is not necessary to apply cocaine previously, as in the pharynx chemical caustics are well borne. It is most important to remember that the tenacious mucus or muco-pus, which so often covers the surface of ulcers and mucous patches, coagulates on the application of a caustic and entirely prevents the latter from reaching the diseased tissues. It is therefore necessary, before applying any caustic, thoroughly to dry the surface by means of absorbent cotton wool.

In the Larynx.—As great care and precision are necessary for the proper application of caustics to the laryngeal mucous membrane, it is in all cases necessary to induce local anaesthesia, so that the surgeon may see clearly what he is doing and may be able to guide the caustic to the diseased area and to that area

only. For directions for anæsthetising the larynx see p. 65, and for introducing the caustic carrier into the larynx see p. 67. The commonest caustics for laryngeal use are chromic acid, lactic acid, salicylic acid, and nitrate of silver.

Chromic Acid is used in the form of crystals fused on a silver probe (p. 36).

Lactic Acid is employed pure or in an 80 per cent. solution by means of a peldorf of cotton wool on a carrier (Fig. 38). The weaker solutions of lactic acid can hardly be considered caustic in action, but rather stimulant, and if the larynx is cocaineised there is no reason why the pure acid should not be used in the first instance if a caustic action is desired.

Salicylic Acid is applied in solutions from 30 to 60 grains to the ounce of absolute alcohol by means of cotton wool twisted on a carrier.

Nitrate of Silver is sometimes used pure fused on to the end of a probe (p. 36).

D. PAINTS

In the Nose.—Paints are not very frequently employed for nasal disease. They are applied under a good illumination to the diseased area by means of pledgets of cotton wool on a carrier.

In the Post-Nasal Space.—Painting is the best method of applying local medications to this region. Caustics, astringents, and stimulants are thus employed. As a caustic, nitrate of silver (60 grains to the ounce) is most useful; as an astringent, chloride of zinc (15 grains to the ounce); and as a stimulant, Mandl's fluid, having the following formula, will be found serviceable:—

Pigmentum Mandl.

R.	Iodine	6 gr. = 0·41 gm.
	Iodide of potassium	20 gr. = 1·37 gm.
	Oil of peppermint	5 m. = 0·31 c.c.
	Glycerin	to 1 oz. = 30 c.c.

Method of Application.—When using strong solutions considerable care must be exercised to prevent any of the fluid reaching the larynx, for, should it do so, it is extremely likely



FIG. 38.—Laryngeal wool carrier.

to cause an alarming spasm of the vocal cords. The difficulty is to pass the brush into the naso-pharynx without the soft palate retracting and catching it. If this occurs some of the fluid is liable to be squeezed out and to reach the larynx. To avoid this accident, it is most important to get a good view of the pharynx, and to see exactly what is being done. A pledget of cotton wool on a suitably bent carrier (Fig. 39) is dipped into the solution and gently squeezed between the folds of a tongue cloth to remove any surplus fluid. The patient is directed to open the mouth and to breathe gently and regularly through it; the tongue is firmly depressed and pulled a little forward (p. 10), whilst the carrier is introduced on its side and passed backwards just above the dorsum of the tongue until it is well behind the soft palate, care being taken not to touch any of the surrounding structures. It is then suddenly and quickly turned upwards into the post-nasal space before the palate has time to contract. It is rapidly swept from side to side over the vault and withdrawn. In some patients it may be necessary to paint the palate with a 5 per cent. solution of cocaine in order satisfactorily to pass the carrier behind it.

In the Pharynx.—The application of paints in this region may often be carried out by the patient, but it is far better that the surgeon himself should apply them if any exactitude is advisable, or if any strong solution is used. The paints, the formulæ for which are given here, should not as a rule be prescribed for the patient's use.

Caustics.—As mild caustics the following may be used :—

FIG. 39.—
Post-nasal wool carrier.

Pigmentum Acidi Chromici.

R.	Chromic acid	10 gr. = 0.69 gm.
	Water	to 1 oz. = 30 c.c.

Pigmentum Acidi Lactici.

R.	Lactic acid, B. P.	20 to 100 per cent.
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Pigmentum Argenti Nitratis.

R.	Nitrate of silver	30 to 60 gr. = 2.06 to 4.11 gm.
	Distilled water	to 1 oz. = 30 c.c.



Pigmentum Cupri Sulphatis.

R.	Copper sulphate	15 gr. = 1.03 gm.
	Water	to 1 oz. = 30 c.c.

Antiseptics.—As a very powerful antiseptic, suitable in the early stages of various kinds of septic throats, the Pigmentum Hydrargyri Perchloridi may be used according to the following formula :—

Pigmentum Hydrargyri Perchloridi.

Perchloride of mercury	1 part
Glycerin	25 parts
Water	75 ,,"

This is a very strong solution and must be used with great caution, and it should be applied once only at the commencement of the affection.

Resorcin is also a good antiseptic, and is prescribed as follows :—

Pigmentum Resorcin.

R.	Resorcin	96 gr. = 6.58 gm.
	Glycerin of borax	to 1 oz. = 30 c.c.

Astringents.—The following are useful astringents :—

Pigmentum Ferri Perchloridi.

R.	Perchloride of iron	60 to 120 gr. = 4.11 to 8.22 gm.
	Water	to 1 oz. = 30 c.c.

Pigmentum Ferri Sulphatis.

R.	Sulphate of iron	60 gr. = 4.11 gm.
	Water	to 1 oz. = 30 c.c.

Pigmentum Zinci Chloridi.

R.	Chloride of zinc	15 to 30 gr. = 1.03 to 2.06 gm.
	Water	to 1 oz. = 30 c.c.

Pigmentum Zinci Sulphatis.

R.	Sulphate of zinc	60 gr. = 4.11 gm.
	Water	to 1 oz. = 30 c.c.

*Sedatives.***Pigmentum Menthol.**

R.	Menthol	30 to 60 gr. = 2.06 to 4.11 gm.
	Liquid paraffin	to 1 oz. = 30 c.c.

Pigmentum Menthol c. Cocaina.

R.	Menthol	30 gr. = 2.06 gm.
	Hydrochloride of cocaine	5 gr. = 0.34 gm.
	Liquid paraffin	to 1 oz. = 30 c.c.

Paints are best applied to the pharynx by means of pledgets of cotton wool on a carrier. The mouth should be gently opened, the tongue depressed, and the pharynx well illuminated. As in the use of caustics, a more powerful action can be obtained if the mucous membrane is first dried with a swab of cotton wool.

In the Larynx.—Paints constitute a useful form of treatment for many laryngeal diseases. They must, however, be skilfully applied by the surgeon, otherwise the parts may be bruised and harm result. A good view of the larynx should be obtained, and the brush applied gently to the diseased part. Bulky carriers should not be used, as they intercept the light and make precision impossible. Any of the mild caustics, astringents, stimulants, and sedatives just enumerated as suitable for the pharynx may also be used in the larynx. For their successful application all the instructions given for introducing instruments into the larynx (p. 67) must be carefully carried out.

E. INSUFFLATIONS

These are beneficial in all the regions of the upper respiratory tract; and though, as a rule, they can be safely left to the patients to use for themselves, there are occasions when it is desirable



FIG. 40.—Kabierskie's insufflator.

for the surgeon himself to apply the powder to the diseased area. For use in the consulting room a De Vilbiss (Fig. 42) or Kabierskie's Insufflator (Fig. 40) is very convenient.

In the nose, naso-pharynx, and pharynx the powders chiefly in use are either sedative or antiseptic in nature.

As *sedatives* the *Insufflatio Bismuthi et Morphinæ* (see p. 33), or *Orthoform* are useful.

As *Antiseptics* the following may be employed :—

Insufflato Iodoformi.

R.	Iodoform	Boric acid in fine powder	}	Equal parts.

Insufflato Iodol.

R.	Iodol	Boric acid in fine powder	}	Equal parts.

Insufflato Iodol et Menthol.

R.	Menthol	8 gr. = 0.55 gm.
	Iodol	80 gr. = 5.48 gm.
	Boric acid in fine powder	200 gr. = 13.71 gm.
	White sugar in fine powder	to 1 oz. = 30 gm.

No special directions are necessary for their use, a good illumination and a suitably shaped end-piece to the insufflator being all that is required.

In the Larynx insufflations are often a beneficial method of treatment, and they have one great advantage over paints, in that by their use there is no possibility of bruising or otherwise injuring

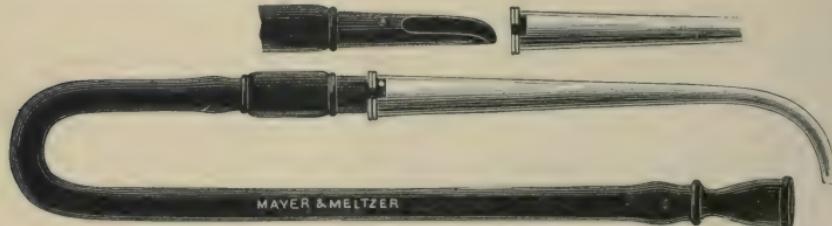


FIG. 41.—MacDonald's insufflator.

the mucous membrane. For laryngeal work, where great accuracy of application is required, MacDonald's Insufflator (Fig. 41) will be found convenient, as it can be held absolutely steady. The method of applying a powder to the larynx is precisely the same as for using a spray (p. 32).

The following insufflations will be found of benefit :—

As a simple *Astringent*—

Insufflato Aluminis.

Alum in fine powder	$\frac{1}{4}$ gr. = 0.016 gm.
Starch	$\frac{3}{4}$ gr. = 0.048 gm.

As the patient becomes accustomed to the astringent action of

the powder, the proportion of starch can be gradually lessened until pure alum is employed.

As an *Antiseptic*—

Insufflatio Iodoformi.

R.	Iodoform in fine powder	1 gr. = 0·06 gm.
	Dried starch in fine powder	$\frac{1}{2}$ gr. = 0·032 gm.

As a *Sedative*—

Insufflatio Morphinæ.

R.	Sulphate of morphine, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$ gr. = 0·004, 0·008, 0·016, 0·032 gm.	
	Dried starch in fine powder	$\frac{1}{2}$ gr. = 0·032 gm.

As an *Analgesic*—

Insufflatio Orthoformi.

R.	Orthoform	3 gr. = 0·21 gm.
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F. SPRAYS

In diseases of the nose, naso-pharynx, and pharynx this method of applying local remedies is generally carried out by the patient,

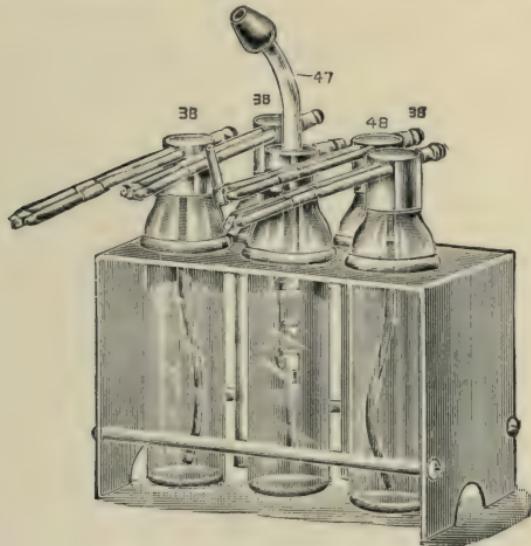


FIG. 42.—De Vilbiss sprays and insufflators.

but it should as a rule be carried out by the surgeon in diseases of the larynx. For the surgeon's use a set of De Vilbiss spray producers will be found very useful (Fig. 42). It contains three atomisers, one nebuliser, and a powder insufflator. Either a

coarse or a fine spray of aqueous solutions can be produced, and oily solutions can be nebulised or atomised. The end-pieces being adjustable, the spray can be directed on to any part.

As *Astringents*, the following will be found beneficial :—

Nebula Ferri Perchloridi.

R.	Perchloride of iron	5 gr. = 0·34 gm.
	Glycerin	15 m. = 0·94 c.c.
	Distilled water	1 oz. = 30 c.c.

Nebula Ferri Sulphatis.

R.	Sulphate of iron	2 gr. = 0·14 gm.
	Distilled water	1 oz. = 30 c.c.

Nebula Zinci Chloridi.

R.	Chloride of zinc	10 to 20 gr. = 0·69 to 1·37 gm.
	Distilled water	1 oz. = 30 c.c.

Nebula Zinci Sulphatis.

R.	Sulphate of zinc	10 to 20 gr. = 0·69 to 1·37 gm.
	Distilled water	1 oz. = 30 c.c.

As *Sedatives* in cases of painful ulceration of the larynx the following oily solutions are very useful :—

Nebula Menthol.

R.	Menthol	5 to 30 gr. = 0·34 to 2·06 gm.
	Liquid paraffin	1 oz. = 30 c.c.

Nebula Menthol cum Cocaina.

R.	Menthol	10 gr. = 0·69 gm.
	Cocaine	5 gr. = 0·34 gm.
	Oleic acid	15 m. = 0·95 c.c.
	Liquid paraffin	1 oz. = 30 c.c.

The method of spraying the larynx has already been described under *cleansing* (p. 32). If the surgeon finds it necessary to spray the nose or pharynx, the part should be well illuminated and a good view obtained.

II. REMEDIES USED BY THE PATIENT

A. EXTERNAL APPLICATIONS

Cold and Heat.—Comfort, and often considerable benefit, may be derived from the external application of cold or heat in acute inflammatory conditions. Speaking generally, cold is the

more serviceable of the two in the very early stages of inflammatory troubles, whilst heat is better if the inflammation is fully established.

Cold can be applied either by the means of a compress or by Leiter's tubes. To apply a compress when the pharynx is affected, a piece of lint three or four plies thick, of sufficient length to reach from ear to ear, and about two and a half inches wide, is wrung out in cold water and applied beneath the chin. A piece of oil-silk an inch longer and wider than the compress is placed over it, and both are held in position by a handkerchief fastened over the head. It is generally used at bedtime, and should be left in position till morning, when the neck should be sponged and well rubbed with a rough towel. When the larynx is affected a similar compress is placed on the neck, well covering the thyroid and cricoid cartilages. Cold is not often indicated in diseases of the nose.

If Leiter's tubes are used the temperature of the water should be about 60° F. (15.6° C.), and it is as well to place a layer of flannel over the neck before applying the tubes. They must not be left on for more than two hours at the most, one hour being generally sufficient.

Heat is very useful in acute nasal troubles in which the sinuses are involved, as well as in pharyngeal and laryngeal inflammations. It may be applied by means of an ordinary linseed poultice, or by spongiopilin or several layers of boric lint wrung out in boiling water. The poultice, however made, should be well covered with oil-silk and fastened in position with a handkerchief. It must be renewed directly the heat is beginning to be lost. Continuous and regular heat can also be applied by means of Leiter's tubes, to which a small portable geyser and a thermometer are attached.

Leeches.—These are useful in many of the more serious acute laryngeal diseases. Directly the gravity of the case is recognised, two or three should be applied over each side of the larynx.

Counter-Irritants.—Blisters, sinapisms, and other counter-irritants such as iodine, are not of much service in diseases of the upper respiratory tract.

B. COLLUNARIA

The chief function of Collunaria, or nasal washes, is to cleanse the mucous membrane of the nose and naso-pharynx; but at the

same time drugs having a sedative, stimulant, or astringent action can be added. They may be sniffed up the nostrils from the



FIG. 43.—Nasal cup.

palm of the hand, from a tablespoon, or from a special glass cup (Fig. 43), or they may be applied by means of a nasal irrigator (Fig. 44), spray, or syringe (Fig. 45). In most cases sniffing the lotion is best, as by this method the fluid is well distributed over the nasal mucous membrane without any force, whereas with an irrigator the fluid travels straight back along the floor of the nose in an undivided stream and its cleansing action is thereby limited. Sprays are unsatisfactory, because the

volume of fluid produced by them is not sufficient to wash away the nasal discharges. The best spray-producer for cleansing purposes is a De Vilbiss universal atomiser, by stopping the hole in the cover of which a very coarse spray can be secured.



FIG. 44.—Nasal irrigator.

For sniffing the lotion the patient is instructed to pour a little of the fluid into the palm of the hand, to sniff it up the nostrils into the throat, and then spit it out of the mouth. About two ounces of the fluid should be thus used at least night and morning, and it should be employed comfortably warm, that is, about 90° F. (32.2° C.). If it causes any retching it should be used before rather than after a meal. Some patients will prefer to sniff from the special cup or a spoon instead of the hand. In young children, should there be any difficulty in following the above methods, success may often be obtained by making them sniff through a small piece of sponge saturated with the fluid and held up to the nostril. If patients cannot in any way acquire the habit of sniffing, then an irrigator or spray must be recommended.



FIG. 45.—Nasal syringe.

Syringing, though the most efficacious method from the point of view of cleansing the nasal cavities, is attended with some risk of subsequent otitis, and should therefore only be used in cases of atrophic rhinitis or tertiary syphilis where it is necessary to free the nasal cavities from crusts, or in very young children in whom it has been found impossible to apply the lotion in any other way. It must always be done carefully, and at first under supervision (p. 29). Apparatus on the syphon principle should on no account be recommended, for the reasons already pointed out (p. 30).

Collunaria used in any of the above ways generally clean the naso-pharynx as well as the nose very effectually, but occasionally they are more efficacious for this purpose if applied with a post-nasal syringe (Fig. 33, p. 30). This is especially so when crusts are adhering to the vault of the naso-pharynx. The patient very quickly acquires the necessary skill to use the syringe for himself.

A great variety of Collunaria are in use. They may be divided into simple detergents, antiseptics, sedatives, stimulants, and astringents.

Detergents.—The most generally useful detergent wash is the Collunarium Alkalimum, the formula for which has already been given on p. 29. In this and some other nasal washes there is a small quantity of carbolic acid, which it may be necessary to omit on account of its causing in some patients a considerable amount of nasal irritation. Its addition, however, makes the lotion more pleasant and less nauseating. The following detergent washes are also beneficial :—

Collunarium Phenol Compositum.

R.	Bicarbonate of sodium	6 gr. = 0·41 gm.
	Carbolic acid	$\frac{3}{4}$ gr. = 0·051 gm.
	Chloride of sodium	1 gr. = 0·07 gm.
	Water	1 oz. = 30 c.c.

Collunarium Potassii Permanganatis.

R.	Permanganate of potassium	$\frac{1}{8}$ gr. = 0·008 gm.
	Chloride of sodium	5 gr. = 0·34 gm.
	Water	to 1 oz. = 30 c.c.

Collunarium Alkalimum Compositum.

R.	Bicarbonate of sodium	2 gr. = 0·14 gm.
	Borax	2 gr. = 0·14 gm.
	Chloride of sodium	2 gr. = 0·14 gm.
	White sugar	5 gr. = 0·34 gm.
	Water	to 1 oz. = 30 c.c.

Antiseptics.—In cases where the discharge is offensive, deodorants and mild antiseptics are indicated. The following are all useful :—

Collunarium "Sanitas" (see p. 29).

Collunarium Boro-Glyceride (see p. 29).

Sedatives.—In acute cases requiring sedatives one of the following may be used, the second of which is slightly stimulating as well as sedative in action :—

Collunarium Benzoini.

R.	Compound tincture of benzoin	5 m. = 0·31 c.c.
	Borax	5 gr. = 0·34 gm.
	White sugar	5 gr. = 0·34 gm.
	Water	to 1 oz. = 30 c.c.

Collunarium Menthol Compositum.

R.	Chloride of sodium	3½ gr. = 0·24 gm.
	Borax	1½ gr. = 0·1 gm.
	Benzoate of sodium	¼ gr. = 0·017 gm.
	Menthol	1/100 gr. = 0·0007 gm.
	Hydrochloride of cocaine	½ gr. = 0·006 gm.
	Water	to 1 oz. = 30 c.c.

Stimulants.—As before stated, the nasal mucous membrane will not tolerate strong stimulants or astringents. All Collunaria must therefore be of a very mild character. The following stimulants may be tried :—

Collunarium Sodii Chloridi.

R.	Chloride of sodium	10 gr. = 0·69 gm.
	White sugar	5 gr. = 0·34 gm.
	Water	1 oz. = 30 c.c.

Collunarium Ammonii Chloridi.

R.	Chloride of ammonium	5 gr. = 0·34 gm.
	Chloride of sodium	3 gr. = 0·21 gm.
	White sugar	5 gr. = 0·34 gm.
	Water	to 1 oz. = 30 c.c.

Collunarium Boracis.

R.	Borax	5 gr. = 0·34 gm.
	Chloride of sodium	5 gr. = 0·34 gm.
	White sugar	5 gr. = 0·34 gm.
	Water	1 oz. = 30 c.c.

Astringents.—Hazelin is perhaps the most useful astringent for intra-nasal work. It is prescribed as follows:—

Collunarium "Hazelin."

R.	Hazelin	.	.	.	.	20 m. = 1·25 c.c.
	Borax	.	.	.	.	5 gr. = 0·34 gm.
	Glycerin	.	.	.	.	5 m. = 0·31 c.c.
	Water	.	.	.	.	1 oz. = 30 c.c.

In some cases where small granulations exist after the removal of polypi, rectified spirit is a good astringent, and is thus prescribed:—

Collunarium Boracis cum Spiritu.

R.	Glycerine of borax	.	.	.	.	10 m. = 0·62 c.c.
	Rectified spirit	.	.	.	.	10 m. = 0·62 c.c.
	Water	.	.	.	.	1 oz. = 30 c.c.

C. SPRAYS

Both aqueous and oily solutions are very commonly prescribed for the patient's use as sprays.

Watery solutions are generally applied by means of an atomiser, but in some cases a Siegle's steam spray will be found more efficacious. Oily solutions require a nebuliser, such as that shown in Fig. 46.

In the Nose and Naso-Pharynx, a spray, as already stated, is not very good for cleansing purposes, but, when this has been accomplished by a hand wash, astringents, stimulants, and sedatives may be applied by this means. As watery solutions any of the Collunaria may be thus used, and as an astringent for drying up granulations or the remains of polypi the Nebula Spiritus et Boracis is most efficacious. It is considerably stronger than the corresponding Collunarium.

Nebula Spiritus et Boracis.

R.	Rectified spirit	.	.	.	.	1 dr. = 3·75 c.c.
	Glycerin of borax	.	.	.	.	1 dr. = 3·75 c.c.
	Water	.	.	.	.	to 1 oz. = 30 c.c.



FIG. 46.—Rouse's nebuliser.

Oily solutions are more often employed for the nose than watery ones.

As *sedatives* the two following may be recommended :—

Nebula Menthol.

R.	Menthol	6 gr. = 0·42 gm.
	Liquid paraffin	1 oz. = 30 c.c.

Nebula Menthol cum Cocaina (see p. 44).

As a *stimulant* the following may be used :—

Nebula Eucalypti.

R.	Oil of eucalyptus	20 m. = 1·25 c.c.
	Liquid paraffin	to 1 oz. = 30 c.c.

As an *antiseptic*—

Nebula Hydrargyri Nitratis.

R.	Nitrate of mercury ointment	40 gr. = 2·74 gm.
	Olive oil	$\frac{1}{2}$ oz. = 15·00 c.c.
	Liquid paraffin	to 1 oz. = 30 c.c.

In the Pharynx.—Both aqueous and oily solutions are useful as sprays for the pharynx, especially in patients who are unable to acquire facility in gargling. It is, however, necessary that the patient should be able to keep the back part of the tongue in a low position, otherwise the fluid does not get beyond the palate. In important cases it is better for the surgeon to apply the spray at least once a day himself. The pharyngeal and laryngeal mucous membrane, as already pointed out, will tolerate stronger remedies than the nasal mucosa, therefore the choice of drugs is greater. The aqueous solutions are chiefly *astringent* in character, and the following may be mentioned :—

Nebula Acidi Tannici (same as for gargle, p. 57).

Nebula Aluminis (same as for gargle, p. 57).

Nebula Cupri Sulphatis (5 grs. to water 1 oz.).

Nebula Ferri Perchloridi
Nebula Ferri Sulphatis
Nebula Zinci Chloridi
Nebula Zinci Sulphatis

} p. 44.

As an *antiseptic* the **Nebula Potassii Permanganatis**, having the following formula, is very useful :—

Nebula Potassii Permanganatis.

R.	Permanganate of potassium	1 gr. = 0·07 gm.
	Chloride of sodium	5 gr. = 0·34 gm.
	Distilled water	1 oz. = 30 c.c.

As a simple *detergent* the Nebula Alkalina (p. 31) is most valuable.

Of the oily solutions the Nebula Menthol and the Nebula Menthol cum Cocaina are most beneficial as sedatives, and the Nebula Eucalypti is a very good stimulant. Their formulæ are given on p. 50, but the strength of the menthol can be increased up to 20 or even 30 grains to the ounce.

In the Larynx.—A patient can be taught to use a spray-producer in such a way that some at all events of the fluid will reach the larynx. A laryngeal end piece is affixed to the apparatus, and the patient is instructed to stand in front of a looking-glass and with its aid to introduce the nozzle until its end nearly touches the posterior wall of the pharynx. The hand must be then well raised so that the end points not only downwards but forwards. The patient must next compress the rubber ball and simultaneously take several sharp forcible inspirations. The spray-producer is then withdrawn and the liquid expectorated. This process must be repeated four or five times. The patient should also occasionally say a prolonged "ee" whilst compressing the ball, for in this way the cords and ventricular bands may be more thoroughly bathed with the solution. Both aqueous and oily solutions may be used by the patient, those most frequently prescribed being the Nebula Alkalina (p. 31) as a detergent, and the Nebula Aluminis, Nebula Ferri Perchloridi, and Nebula Zinci Chloridi as astringents, and the Nebula Menthol as a sedative.

D. STEAM INHALATIONS

This method of local medication is chiefly used in laryngeal diseases, but it is also of service in nasal and pharyngeal affections. Some authorities maintain that so slight and diluted a dose of the active ingredient reaches the affected part, that inhalations are a comparatively useless method of local treatment. On the other hand it is a method that can be conveniently carried out by patients and one which is nearly always appreciated by them; and, whether the benefit is due to the steam or to the ingredient, it is undoubtedly a fact that it often does good in both chronic and acute affections, especially of the larynx.

The general directions for the use of steam inhalations are the same for whatever region of the upper respiratory tract they are used.

The patient should be directed to boil a pint of water, pour it into a quart jug, leave it for six minutes to cool down to the required temperature, namely 140° F. (60° C.), to add a teaspoonful of the medicament, to put a towel over his head and over the mouth of the jug, and breathe in the steam for ten minutes, taking six or eight deep breaths to the minute. In place of the towel a newspaper cone may be made, one end of which is fitted over the jug and the other over the patient's mouth and nose. This is often preferred, as it is not so hot a process as enveloping the whole head in a towel. The inhalation should be repeated at least night and morning, and in some acute cases as often as every four hours. It must be carried out in a warm room not under 60° F. (15·6° C.), and the patient should remain in the room for at least half-an-hour after using the inhalation. When desirable a special inhaler, such as Maw's, Bullock's, or Martindale's, may be recommended, and the exact temperature of the water can be secured by means of a thermometer.

In nasal affections respiration should be conducted through the nose, and in pharyngeal or laryngeal troubles through the mouth, but inasmuch as in the majority of cases both nose and throat are affected it is as well to direct the patient first to inspire through the nose and expire through the mouth, and then to inspire through the mouth and expire through the nose, by doing which all parts of the mucous membrane get the benefit of the inhalation. If patients are not cautioned as to the proper temperature of the water as a rule they use it as near boiling point as possible, which generally does more harm than good, especially in laryngeal diseases.

One or two ounces of inhalation are generally prescribed at a time, a teaspoonful of which is used at each inhalation. The following inhalations will be found serviceable :—

As sedatives—

Vapor Tincturæ Benzoini.

R. Compound tincture of benzoin 1 oz. = 30 c.c.

Vapor Menthol.

R. Menthol	16 gr. = 1·1 gm.
Rectified spirit	2 dr. = 7·5 c.c.
Light carbonate of magnesium	8 gr. = 0·55 gm.
Water	to 1 oz. = 30 c.c.

As *stimulants*—

Vapor Creosoti.			
R.	Creosote	80 m. = 5 c.c.	
	French chalk	30 gr. = 2.06 gm.	
	Water	to 1 oz. = 30 c.c.	

Vapor Pini Sylvestris.

R.	Oil of Scotch pine	40 m. = 2.5 c.c.	
	Light carbonate of magnesium	20 gr. = 1.37 gm.	
	Water	to 1 oz. = 30 c.c.	

Vapor Eucalypti.

R.	Oil of eucalyptus	20 m. = 1.25 c.c.	
	Light carbonate of magnesium	10 gr. = 0.69 gm.	
	Water	to 1 oz. = 30 c.c.	

Vapor Cubebæ.

R.	Oil of cubebæ	40 m. = 2.5 c.c.	
	Light carbonate of magnesium	20 gr. = 1.37 gm.	
	Water	to 1 oz. = 30 c.c.	

Vapor Terebenæ.

R.	Terebene, pure	40 m. = 2.5 c.c.	
	Light carbonate of magnesium	20 gr. = 1.37 gm.	
	Distilled water	to 1 oz. = 30 c.c.	

Vapor Thymol.

R.	Thymol	6 gr. = 0.41 gm.	
	Rectified spirit	1 dr. = 3.75 c.c.	
	Light carbonate of magnesium	3 gr. = 0.21 gm.	
	Water	to 1 oz. = 30 c.c.	

E. DRY INHALATIONS

These are also useful in diseases of any part of the upper respiratory tract, especially in patients who complain that the heat of the steam inhalations causes a feeling of faintness. Moreover for busy men they are more quickly applied, and there is no necessity to remain in a warm room afterwards. They are best used by means of a respirator containing cotton wool or a sponge on which are put 20 to 30 drops of the medicament (Fig. 47). This should be worn from half-an-hour to an hour night and morning.

Any of the volatile oils, or thymol and menthol, can be used in

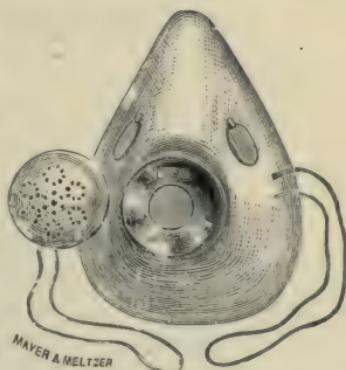


FIG. 47.—Mackenzie's respirator.

this way, and in the same proportion as for steam inhalations, only instead of mixing them with light carbonate of magnesia and water, they are dissolved in spirit. Thus the Vapor Creosoti Siccus has the following formula :—

Vapor Creosoti Siccus.

R.	Creosote	80 m. = 5 c.c.
	Rectified spirit	to 1 oz. = 30 c.c.

Amongst dry inhalations of the stimulating variety must be mentioned the Vapor of Chloride of Ammonium, which is made by mixing the vapours of ammonia and hydrochloric acid by means of a special apparatus. There are many forms of inhalers for this purpose, but perhaps Basdon's is the simplest and most efficacious. The vapour should be inhaled through the mouth and exhaled through the nose. Its scope of usefulness is strictly limited.

F. INSUFFLATIONS

Analgesic, sedative, and antiseptic powders can with advantage be given to the patient to use for himself. In the nose they can be used as a "snuff" or by means of an insufflator (Fig. 48). The Insufflatio Bismuthi et Morphinæ (p. 33) and the Insufflatio Iodol



FIG. 48.—Hovell's insufflator.

et Menthol (p. 42) are useful sedatives in acute conditions, and iodoform and iodol, diluted with equal parts of starch, may be employed as antiseptics. In the pharynx, orthoform as an analgesic, and iodoform as an antiseptic may be used either separately or combined in cases of painful ulceration of whatever nature. Until recently it has been difficult for a patient to insufflate his own larynx with any certainty, but a method has been introduced by Leduc which renders this possible. Leduc's

auto-insufflator consists of a glass tube bent as shown in Fig. 49. The short end is introduced into the pharynx nearly to the posterior wall, whilst the long end is placed in close apposition to a watch glass or saucer on which a little of the powder is sprinkled. The lips being tightly closed round the tube, the patient takes one or two short sharp breaths through it, when the inspired air

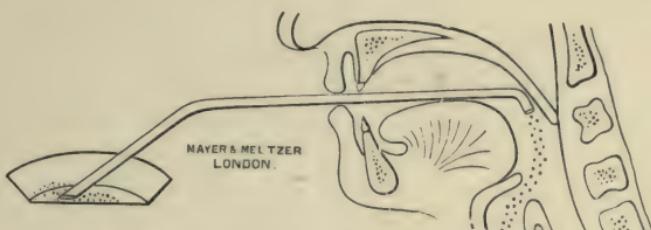


FIG. 49.—Method of using Leduc's auto-insufflator.

will carry the powder into the larynx. That this is so, can be proved by examining the larynx immediately after the patient has finished, when the powder will be seen distributed over the arytenoids, ventricular bands, and cords.

The most important powder for use in this way is the insufflato orthoformi, for by its use once, or at the most twice a day, the patient is able to keep himself free from pain, and is often enabled to eat with comfort even when severe ulceration is present. When indicated, iodoform can be used either alone or with orthoform.

G. PAINTS

In pharyngeal diseases a few paints may be trusted to the patient, though, as before said, if exactitude of application is desirable, they should be applied by the surgeon himself at least once a day.

As a *sedative and antiseptic* the following may be used :—

Pigmentum Boro-Glyceride.

R. Boro-glyceride 2 to 6 dr. = 8.22 to 24.66 gm.
Water to 1 oz. = 30 c.c.

As a *stimulant* the Pigmentum Mandl (p. 38), and as an *astringent* the Pigmentum Ferri Perchloridi (gr. 60 to the ounce of water) may be prescribed.

H. GARGLES

These are chiefly applicable to cases in which the uvula, soft palate, and anterior pillars of the fauces are the parts affected. It is doubtful whether in an ordinary way the tonsils or lateral and posterior walls of the pharynx are bathed with fluid in the act of gargling. A good deal, however, depends on the dexterity of the patient. Von Troeltsch maintains that these parts, together with the vault of the naso-pharynx and Eustachian cushions, can be reached by the following method: The patient sits, or better still lies down, with the head well thrown back, a mouthful of gargle is taken and the movements of swallowing are made without letting the fluid go down the throat. This is difficult of performance, and patients do not often persist in their efforts to carry it out. Gargles, however, are very useful if some discrimination is exercised in selecting the cases in which they are to be prescribed. In acute conditions they should be used at least every four hours, and in chronic cases at least night and morning. About half an ounce of fluid is taken in the mouth for each act of gargling, and this should be repeated five or six times on each occasion.

As an *antiphlogistic* gargle the following is useful:—

Gargarisma Sodii Bicarbonatis.

R.	Bicarbonate of sodium	40 gr. = 2.74 gm.
	Carbonate of sodium	10 gr. = 0.69 gm.
	Water	to 1 oz. = 30 c.c.

It must be mixed with equal parts of boiling water for use. If employed in the early stages of acute tonsillitis or peritonsillitis it gives much relief, and occasionally seems to check the attack. It should be freely swabbed on to the tonsils with a sponge affixed to a holder, as well as being used as a gargle.

As *sedative* gargles the following may be mentioned:—

Gargarisma Boracis.

R.	Borax	15 gr. = 1.03 gm.
	White sugar	10 gr. = 0.69 gm.
	Water	to 1 oz. = 30 c.c.

Gargarisma Alkalina.

R.	Chlorate of potassium	12 gr. = 0.82 gm.
	Bicarbonate of sodium	6 gr. = 0.41 gm.
	Bicarbonate of potassium	6 gr. = 0.41 gm.
	Water	to 1 oz. = 30 c.c.

Gargarisma Potassii Chloratis.

R.	Chlorate of potassium	12 gr. = 0·82 gm.
	Water	to 1 oz. = 30 c.c.

As *antiseptics*.—The following are those in general use:—

Gargarisma Potassii Permanganatis.

R.	Permanganate of potassium	$\frac{1}{8}$ gr. = 0·008 gm.
	Distilled water	to 1 oz. = 30 c.c.

Gargarisma Hydrargyri Perchloridi.

R.	Perchloride of mercury	$\frac{1}{8}$ gr. = 0·008 gm.
	Glycerin	24 m. = 1·5 c.c.
	Water	to 1 oz. = 30 c.c.

Gargarisma Hydrargyri et Potassii Chloratis.

R.	Black wash	$\frac{1}{2}$ oz. = 15 c.c.
	Chlorate of potassium	12 gr. = 0·82 gm.
	Water	to 1 oz. = 30 c.c.

This, as well as being antiseptic, is a powerful sedative, and quickly relieves the pain attending either secondary or tertiary syphilitic ulcers about the pharynx.

As *stimulants* may be mentioned—

Gargarisma Ammonii Chloridi.

R.	Chloride of ammonium	10 gr. = 0·69 gm.
	Glycerin	10 m. = 0·62 c.c.
	Water	to 1 oz. = 30 c.c.

Gargarisma Sodii Chloridi.

R.	Chloride of sodium	12 gr. = 0·82 gm.
	Glycerin	10 m. = 0·62 c.c.
	Water	to 1 oz. = 30 c.c.

As an *astringent*—

Gargarisma Acidi Tannici.

R.	Glycerin of tannin	1 dr. = 3·7 c.c.
	Camphor water	to 1 oz. = 30 c.c.

Gargarisma Aluminis.

R.	Alum	8 gr. = 0·55 gm.
	Water	to 1 oz. = 30 c.c.

Gargarisma Aluminis et Potassii Chloratis.

R.	Alum	6 gr. = 0·41 gm.
	Chlorate of Potassium	15 gr. = 1·03 gm.
	Water	to 1 oz. = 30 c.c.

Gargarisma Boracis Compositum.

R.	Borax	24 gr. = 1·64 gm.
	Glycerin	24 m. = 1·5 c.c.
	Tincture of myrrh	24 m. = 1·5 c.c.
	Water	to 1 oz. = 30 c.c.

I. LOZENGES AND PASTILS

These are very helpful in the treatment of pharyngeal troubles and often give some relief in laryngeal affections. It must be remembered that many of them have a great tendency to upset the digestion, and that therefore they must be used with some discretion. Pastils dissolve rather more slowly than lozenges and so far give a better local action, but in lozenges the currant paste employed as a basis is in itself a pleasant demulcent. Further, there are chemical reasons why some substances should be made into lozenges rather than pastils; for instance, tannin and krameria are incompatible with the gelatin used for the latter. Pastils are made up with a glyco-gelatin basis, and lozenges with either a red currant or black currant paste, with the exception of the carbolic acid lozenge. They are all now more or less commercial articles, and therefore the only important point is to mention the amount of active ingredient or ingredients which should be contained in each pastil or lozenge.

Pastils are mostly sedative. The following may be mentioned as useful examples :—

Pastillus Bismuthi (3 grs.).

Pastillus Bismuthi et Morphinæ (bismuth, 3 grs.; acetate of morphine, $\frac{1}{40}$ gr.).

Pastillus Cocainæ ($\frac{1}{10}$ gr.).

Pastillus Menthol ($\frac{1}{8}$ gr.).

Pastillus Menthol et Eucalypti (menthol, $\frac{1}{20}$ gr.; oil of eucalyptus, 1 m.).

Pastillus Guaiaci Compositus (guaiac, 1 gr.; chlorate of potash, 2 grs.).

Pastillus Ammonii Chloridi (2 grs.).

Lozenges.—There are a great variety of serviceable lozenges. As *sedatives* may be mentioned :—

Trochisci Sedativi (extract of opium, $\frac{1}{10}$ gr.).

Trochisci Boracis (3 grs.).

As *stimulants*—

Trochisci Acidi Benzoici ($\frac{1}{2}$ gr.).

Trochisci Acidi Carbolici (1 gr.).

Trochisci Ammonii Chloridi (2 grs.).

Trochisci Ammonii Chloridi Compositi (ammon. chloride, 1 gr. ; potas. chlorate, 2 grs., cubebæ in powder, $\frac{1}{4}$ gr.).

Trochisci Potassii Chloratis (3 grs.).

Trochisci Potassii Chloratis cum Borace (of each $1\frac{1}{2}$ gr.).

As *astringents* may be mentioned :—

Trochisci Krameriae (3 grs.).

Trochisci Acidi Tannici ($1\frac{1}{2}$ gr.).

Trochisci Catechu (2 grs.).

Trochisci Cubebæ ($\frac{1}{2}$ gr.).

Of these the krameria lozenge is the most generally useful, as it is best tolerated by the stomach. Tannic acid is a very much more powerful astringent, but soon upsets the digestion.

Two very good *analgesic* lozenges must be mentioned, namely, the—

Trochisci Cocainæ ($\frac{1}{10}$ gr.).

Trochisci Orthoformi (2 grs.).

As an *antiphlogistic* in acute tonsillitis and peritonsillitis the following has gained a good repute :—

Trochisci Guaiaci (2 grs.).

K. MIXTURES

As the following mixtures will be constantly referred to in the text, it will save repetition if their formulæ are given here :—

Mistura Alba.

R.	Sulphate of magnesium	60 gr. = 4.11 gm.
	Carbonate of magnesium	10 gr. = 0.69 gm.
	Peppermint water	to 1 oz. = 30 c.c.

Mistura Aromatica.

R.	Tincture of nux vomica	5 m. = 0.31 c.c.
	Aromatic spirit of ammonia	20 m. = 1.25 c.c.
	Spirit of chloroform	20 m. = 1.25 c.c.
	Water	to 1 oz. = 30 c.c.

Mistura Ferri Perchloridi.

R.	Solution of perchloride of iron, 20 to 30 m. = 1.25 to 1.87 c.c.
	Chloroform water
	Infusion of quassia

Mistura Gentianæ cum Soda.

R.	Bicarbonate of soda	10 gr. = 0.69 gm.
	Spirit of chloroform	15 m. = 0.94 c.c.
	Compound infusion of gentian	to 1 oz. = 30 c.c.

Mistura Potassii Iodidi.

R.	Iodide of potassium	3 to 30 gr. = 0·2 to 2·06.
	Carbonate of ammonium	5 gr. = 0·34 gm.
	Caramel	1 m. = 0·06 c.c.
	Chloroform water	2 dr. = 7·5 c.c.
	Infusion of quassia	to 1 oz. = 30 c.c.

Mistura Rhei cum Nuce Vomica.

R.	Bicarbonate of sodium	10 gr. = 0·69 gm.
	Tincture of nux vomica	5 m. = 0·31 c.c.
	Chloroform	1 m. = 0·06 c.c.
	Infusion of rhubarb	½ oz. = 15 c.c.
	Peppermint water	to 1 oz. = 30 c.c.

Mistura Rhei Ammoniata.

R.	Powdered rhubarb	5 gr. = 0·34 gm.
	Carbonate of ammonium	5 gr. = 0·34 gm.
	Peppermint water	to 1 oz. = 30 c.c.

Mistura Arsenici Alkalina.

R.	Solution of arsenic	3 m. = 0·19 c.c.
	Bicarbonate of sodium	10 gr. = 0·69 gm.
	Tincture of calumba	20 m. = 1·25 c.c.
	Chloroform water	to 1 oz. = 30 c.c.

CHAPTER III

ON OPERATIVE TREATMENT

I. INTERNAL OPERATIONS: A. *General Preliminaries*.—B. *Local Anæsthesia*.—Methods of Induction—Cocaine Poisoning.—C. *Use of Instruments*.—D. *After Treatment*. II. EXTERNAL OPERATIONS: A. *Laryngotomy*.—Indications—Method. — B. *Tracheotomy*.—Indications—Method. — C. *Intubation*.—Advantages and Disadvantages—Method.—D. *Thyrotomy*.—Method.

IN this chapter such questions will be discussed, and such operations described, as are applicable to many of the conditions to be detailed in later chapters in order that repetition may be avoided as far as possible.

The subject is best divided into :—

- I. Preliminaries and after-treatment of internal operations.
- II. External operations.

I. INTERNAL OPERATIONS

A. GENERAL PRELIMINARIES

Before all internal operations, whether within the nose, pharynx, or larynx, certain preliminary steps must be taken. In the first place, it is more than ever necessary to gain the patient's confidence and accustom him to the use of instruments (p. 9).

Secondly, the area of operation in some cases should be cleansed by washing it with some mild antiseptic lotion (p. 29), though, as already pointed out, it is impossible to render the part thoroughly aseptic, because any antiseptic lotion sufficiently strong to act as a germicide would cause serious damage to the mucous membrane. In the next place, all instruments should be sterilised by boiling in the usual way and placed in 1 in 20 carbolic lotion. Immediately before the actual operation is commenced they should be transferred to boiled water, because 1 in 20 carbolic lotion is strong enough to cause destruction of the epithelial covering of the mucous membrane and to set up much inflammation, especially in the nose and larynx.

Thirdly, it is almost always necessary to induce general or

local anaesthesia. As regards the former little need be said here, except that for nasal and post-nasal operations of short duration gas alone, or ethyl chloride alone, gives a good and sufficient anaesthesia, whilst in cases of longer duration it is advisable to start with gas or A.C.E. and give a final dose of pure ether. It is most important not to push the anaesthetic sufficiently far to abolish the reflexes entirely, for it is absolutely necessary that the patient should be able to swallow the blood which reaches the pharynx (see also Chapter xvi., p. 396). Before the more extensive operations on the pharynx and naso-pharynx it is often advisable to perform a preliminary laryngotomy (p. 75), and plug the upper aperture of the larynx with sponges as suggested by Bond.

B. INDUCTION OF LOCAL ANAESTHESIA

As local anaesthetics cocaine and eucaine alone, or in conjunction with some preparation of supra-renal extract, are at the disposal of the surgeon.

Cocaine is the most generally useful, but very serious and even fatal cases of poisoning by this drug have been recorded. It must, therefore, always be used with caution, especially in the first instance, for certain individuals seem peculiarly susceptible even to small doses. The very young and the very old are also as a rule intolerant of the drug.

Eucaine is useful in cases in which cocaine has been found, or may be expected, to disagree. Its action is slower, but its effects are slightly longer in duration ; the anaesthesia and vascular contraction are not so complete, but its toxic effects are less marked : owing to its insolubility it cannot be used stronger than in a 5 per cent. solution.

In using these drugs it must be remembered that poisoning is more often caused by absorption from the stomach than from the mucous membranes of the upper air passages, and care must therefore be taken that the patient does not swallow the solution. The indiscriminate use of a spray must be abandoned, and painting or packing the part with pledgets of cotton wool squeezed out in the solution substituted.

Cocaine is generally used in a 10 per cent. solution, but 5 per cent. is usually sufficient for the purposes of examination, whereas a 20 per cent. solution may be required as a final application before some operations. Solutions of this drug do

not keep very well ; fungoid growths quickly form in them, and they are apt to turn brown if left in contact with the metal stem of a spray producer. These results may be delayed by the addition of half a grain of salicylic acid to each ounce of solution. For consulting-room work cocaine may be kept in the form of tablets each containing five grains, by dissolving one of which in fifty drops of water an absolutely fresh 10 per cent. solution is quickly made.

Supra-Renal Extract is a very powerful astringent of the blood-vessels and mucous membrane. It is chiefly used in nasal work, and is especially useful when cocaine poisoning is feared, and when it is important to see exactly what is being done during operations. By its addition, cocaine can be used weaker, but with the same anaesthetic effect, while the chances of poisoning are still further diminished by the constriction of the blood-vessels. Its ischaemic action also makes it possible to perform minor operations with but little blood to obscure the view. The objections to its use are that there is a distinct tendency to reactionary dilatation of the blood-vessels, which may lead to violent and sometimes serious secondary haemorrhage, and that its use is often followed by all the symptoms of very acute rhinitis, lasting from twenty-four to forty-eight hours. The haemorrhage may commence at any time within the first twenty-four hours, and some arrangement should therefore be made for the patient's supervision during this period.

There are many preparations of extract of supra-renal gland on the market, all of which are fairly efficacious when fresh, but they soon lose power. It is better therefore to make a fresh extract for each case, which may easily be done by mixing five grains of Armour's desiccated gland with 100 drops of water in a test tube and heating them in a steriliser for ten minutes. A fresh solution which acts very well can also be prepared by means of soloids of hemisene.

Methods of Application.—In the Nose.—If the internal structures of the nose are much swollen, so that force would be required to introduce the pledges of wool, a single preliminary puff of 10 per cent. solution of cocaine is given with a spray, and the patient's head immediately bent forward over a bowl to allow any surplus fluid to run out. After two or three minutes' interval, when the mucous membrane has become somewhat constricted and insensitive, pledges of wool soaked in, but not

over-saturated with, the cocaine are applied by means of forceps to the inferior turbinal and all round the part to be operated upon. The head is bent forward after the introduction of each pledget to allow of the escape of any free fluid, and, should any run back into the pharynx, the patient must be made to spit it out at once. These pledges should be left in position for at least ten minutes and then withdrawn. Finally, if dealing with very nervous patients, or if about to cut through bone, the immediate site of operation may be painted with a little 20 per cent. solution. It is best applied by means of cotton wool on a carrier. If any cocaine reaches the pharynx, it produces the sensation of a lump in the throat and inability to swallow, which is often very alarming and distressing to the patient.

If supra-renal extract is used to prevent cocaine poisoning, the mucous membrane is first painted with a 5 per cent. solution of the extract to contract the blood-vessels, and then a solution containing 5 per cent. of cocaine and 5 per cent. of the extract is applied to the area of operation for fifteen minutes on swabs of cotton wool. If there is no particular reason to fear poisoning, but a cutting operation is about to be performed, the strength of the cocaine may be increased up to 10 per cent., 15 per cent., or even 20 per cent. For ordinary purposes the following solution, which keeps well for many months, may be used :—

Solutio Cocainæ et Extracti Suprarenalis.

R.	Hydrochloride of cocaine	48 gr. = 3.3 gm.
	Supra-renal extract (Merck)	24 gr. = 1.64 gm.
	Salicylic acid	½ gr. = 0.034 gm.
	Distilled water	to 1 oz. = 30 c.c.

In the Post-Nasal Space.—It is very seldom necessary to induce anaesthesia of the mucous membranes of the naso-pharynx, but when it is, the palate must first be painted with a 10 per cent. solution of cocaine, and then a spray producer with a suitably curved end is passed behind it, and the naso-pharynx sprayed once or twice with a 10 per cent. solution. Finally, the part to be operated upon is painted with a 20 per cent. solution. The patient must be cautioned not to swallow the cocaine.

In the Pharynx.—In this region anaesthesia is chiefly required for cauterisation, but may also be employed for removal of the

tonsils or uvula, and for other small operations. It is also occasionally necessary as a preliminary to a successful examination of the post-nasal space or larynx, and always before operations on these parts. A 10 per cent. solution of cocaine produces a sufficiently deep anaesthesia to allow of the cautery being applied painlessly. The area anaesthetised can be strictly limited to the spot or spots to be burned. The patient's mouth is opened, the light is focussed on the pharynx, the tongue is depressed (p. 10), and a pledget of cotton wool affixed to a carrier and squeezed out in the cocaine solution is applied to the exact spot and retained there for four or five seconds, during which the patient should take short, quick breaths in and out of the mouth. If there is any tendency to retching, the tongue depressor may be removed directly the wool is in position. This should be repeated three or four times, care being taken that the patient does not swallow any cocaine. After each application he should spit out any of the solution which may have been squeezed out of the wool. An interval of from five to ten minutes is allowed to elapse between the last application and the use of the cautery.

To anaesthetise the palate and uvula preliminary to examination of, or operation on, the post-nasal space or larynx, the parts should be brushed over once or twice with a 5 per cent. solution of cocaine. It must be remembered that the more sensitive and nervous a patient is, the greater is the liability to cocaine poisoning, hence special care is necessary.

In the Larynx.—The following is the safest method of inducing local anaesthesia of the larynx. The palate is first brushed over with a 5 per cent. solution of cocaine, and after two minutes' interval a laryngeal spray containing a 10 per cent. solution of cocaine is introduced in the manner described under cleansing (p. 32), and the laryngeal mucous membrane is sprayed just once with the solution. In doing this it is necessary to direct the spray well forward, and not to allow any solution to reach the lower parts of the posterior wall of the pharynx, otherwise some is sure to be swallowed at the risk of poisoning. The object of the preliminary spray is to produce a slight general anaesthesia, which allows of the next step being carried out in comfort. A fair-sized pledget of cotton wool is now *securely* twisted on to a laryngeal wool carrier (Fig. 38, p. 38) and dipped into a 10 per cent. solution of cocaine. A satisfactory view of the larynx having been obtained (p. 21), the carrier is introduced (p. 67) with the right hand and

carefully guided on to the epiglottis, which is then gently painted. The carrier is withdrawn and the patient encouraged to spit up any solution which may have trickled down the pharynx. The wool is again saturated with cocaine and re-introduced, and this time carried down to the arytenoids and posterior parts of the larynx, which are well painted. On the third occasion the ventricular bands and the cords are painted, and the process is repeated until all the parts are rendered so anaesthetic that the introduction of the cotton wool no longer causes reflex coughing or choking. Between each introduction the patient should cough up any solution which may have escaped from the wool, and if the wool gets coated with mucus a fresh piece should be twisted on the carrier. Finally, before actually commencing to operate, a little 20 per cent. solution of cocaine may be allowed to trickle from the wool over the immediate area of operation.

Eucaine may be substituted for cocaine for inducing anaesthesia of any part of the upper respiratory tract, but as its strength cannot be increased beyond 5 per cent., it is not so generally serviceable as cocaine.

Cocaine Poisoning.—In spite of all precautions cocaine and even eucaine may produce toxic effects. In slight cases excitability, talkativeness, loss of self-control, restlessness, and in neurotic persons a marked attack of hysteria may occur, followed by tremblings, depression, and sleeplessness. In severer cases the patient complains of giddiness, faintness, palpitation, and praecordial discomfort, with tingling of the hands and feet. A cold sweat appears on the forehead, the face becomes pale, the pulse small and rapid, respiration accelerated, the pupils dilated, and finally the patient becomes prostrated. In very severe cases these symptoms pass on to delirium, cramps of the flexor muscles of the limbs and especially of the arms, cyanosis and convulsions, and occasionally death.

Treatment.—In the very young, the very old, in neurotic persons, and in those in whom an idiosyncrasy to cocaine poisoning is known to exist, prophylactic measures should be taken. A preliminary dose of some stimulant, either sal-volatile or brandy, should be given, and the strength of the cocaine solution should not exceed 4 per cent. or 5 per cent. It should be combined with supra-renal extract in the manner already described, and the amount used should be strictly limited.

Restorative Treatment.—In slight cases the recumbent position

and a teaspoonful of sal-volatile are generally sufficient to restore the patient to comfort. Severer cases usually commence during the operation, which should then of course be finished off as quickly as possible and the patient laid on a sofa, the foot of which should be raised. The clothing must be loosened, and a drachm of sal-volatile or an ounce of brandy administered, followed as quickly as possible by strong black coffee, to which brandy may be again added if there is much collapse. If the patient is unable to swallow, $\frac{1}{100}$ of a grain of strychnine should be injected subcutaneously, and brandy administered by the rectum. If there is reason to believe that much cocaine has been swallowed, the stomach should be promptly washed out or an emetic dose of mustard and water administered.

C. THE USE OF INSTRUMENTS

No general directions can be given as regards the use of instruments in the nose and pharynx, as the method will vary according to the particular operation to be performed; but with regard to the larynx there is much common to all operations, which may be discussed here.

Introduction of Instruments into the Larynx.—Every intra-laryngeal manipulation, from painting to the removal of growths, requires the introduction of instruments. All laryngeal instruments are designed on much the same principle, having a long handle with a shorter laryngeal end-piece set either at a right or slightly obtuse angle (Figs. 38 and 242). It is evident, therefore, that the method of introduction must be the same for all varieties of instruments. It is of very great advantage to be able to use either hand with equal facility, so that the right hand may be employed for the right side of the patient's larynx and the left hand for the left side. In this way the affected area will never be lost sight of, whereas if the right hand is employed for the left side of the patient's larynx or *vice versa* there is great difficulty in preventing the instrument from hiding the spot under operation at some period of its introduction, often at a critical moment. To use the left hand freely and accurately requires considerable practice, but the acquisition of the necessary dexterity is well worth the time and patience involved in the process. In the following description of the introduction of instruments it is assumed that the surgeon is using his right hand on the right

half of the patient's larynx. The duties of the hands must be reversed if the patient's left side is affected.

As large a mirror as can be comfortably tolerated by the patient is selected, and all the instruments are warmed in a bowl of hot water. The patient is then instructed to hold out his tongue between the folds of a tongue cloth with his *right* hand, and the surgeon places the mirror in position with his *left* hand, and having made sure that he can obtain a good view of the



FIG. 50.—Method of introducing laryngeal instruments: first position.

larynx, withdraws it for a few moments to give the patient a rest. The mirror having been again introduced and a good view obtained, the surgeon proceeds to introduce the instrument with his *right* hand. At first it may be guided by direct vision, but when the end passes out of sight, its farther course must be directed by the reflected image in the mirror. It must be remembered that this image is reversed in the antero-posterior direction, and that the surgeon's movements will also appear to be so (Fig. 25, p. 20).

The difficulties likely to be encountered are, first, in passing the laryngeal portion of the instrument between the base of the tongue

and the palate and over the epiglottis; secondly, in directing the distal end out of the pharynx, over the arytenoids, into the larynx; and thirdly, in lowering it sufficiently to reach the vocal cords. This last difficulty arises from the fact that it is

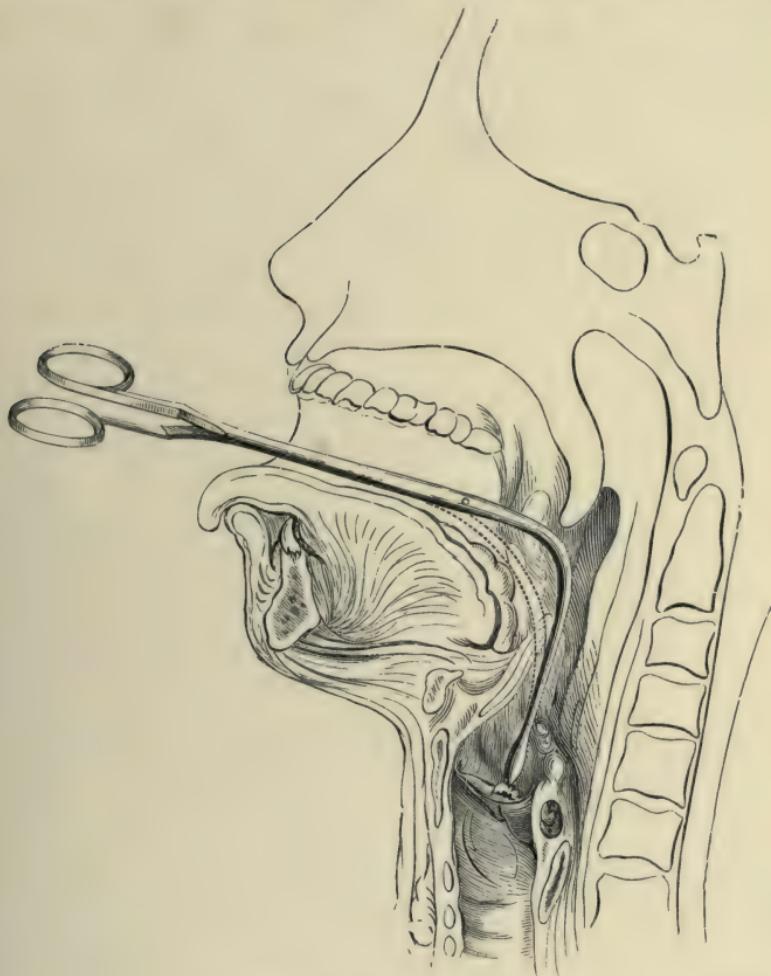


FIG. 51.—The forceps in position.

impossible to realise from the image in the mirror the distance between the tips of the arytenoids and the vocal cords. They seem very much nearer together than they really are. In dealing with the first difficulty it must be remembered that if the instrument is introduced straight into the mouth with the laryngeal end pointing downwards, it is often a physical impossibility to pass the laryngeal portion between the palate and the

base of the tongue. It must therefore be introduced into the mouth on its side, that is, with the shaft and the laryngeal portion in the same horizontal plane or nearly so (Fig. 50). In this position, with the point leading and the shaft directed towards the angle of the patient's mouth, the instrument is passed onwards into the pharynx until it almost touches the posterior pharyngeal wall. The point then being well behind the epiglottis, the instrument can be brought into its natural position, and the point lowered by simultaneously rotating the wrist and bringing the hand nearer the middle line (Fig. 51). To overcome the second difficulty, namely, that of passing the instrument out of the pharynx into the larynx, the point must be directed forward away from the posterior wall of the pharynx as soon as it is well over the epiglottis, and it must be kept pointing forward whilst it is lowered into the larynx. This is best accomplished by raising the hand and flexing the wrist. If this is not successfully carried out the point will catch and bruise the arytenoids, and it will have to be partially withdrawn before it can be passed into the larynx. The third difficulty, viz. that of reaching the cords, is overcome by selecting in the first instance a sufficiently long instrument, and by flexing the wrist still farther when the point is successfully guided over the arytenoids into the larynx.

D. AFTER-TREATMENT

Nasal Operations.—After all intra-nasal operations the local treatment as a rule consists solely in the prevention of complications, and except with this end in view it may be said, broadly speaking, that the less the case is interfered with the better. Occasionally special measures may be necessary to gain the end for which the operation was undertaken, as, for instance, after straightening a deviated septum, but when such measures are called for they will be described under the particular operation. The complications which have to be guarded against have already been enumerated under cauterisation (p. 34), and were seen to consist in the formation of adhesions and the occurrence of various forms of septic poisoning, such as acute suppuration of the middle ear, acute tonsillitis, erysipelas, septicæmia, and even meningitis. After all forms of cutting operations one other danger may arise and require special treatment, namely, haemorrhage. It will be necessary therefore to consider (1) the means of preventing

adhesions ; (2) the prevention of septic absorption ; and (3) the arrest of haemorrhage.

Means of Preventing Adhesions.—Adhesions only occur when opposing surfaces within the nose have been injured, and therefore the first essential of preventive treatment is care in operating. If the nares are narrow the use of supra-renal extract, whether in conjunction with local or general anaesthesia, is most helpful by reason of its action in causing contraction of the turbinates and so enlarging the distance between the inner and outer walls of the nose, and also by rendering the operation comparatively bloodless. Its tendency to cause secondary haemorrhage (see p. 63) and acute rhinitis must however be remembered, and it must not therefore be used indiscriminately. In the next place, all patients should be seen within forty-eight hours of an operation, and commencing adhesions carefully looked for. If found, they should be gently broken down with a probe, and a two-ply strip of ribbon gauze inserted between the raw edges and changed daily till the healing is complete. If the patient cannot attend every day, a very thin Lake's india-rubber splint, or a piece of celluloid shaped like a Lake's splint, may be used instead of the gauze, and left in position for four or five days, the nose being kept clean in the meanwhile by the use of alkaline lotion (p. 29). If it is known at the time of operation that opposing surfaces have been wounded, the gauze, Lake's splint, or piece of celluloid should be introduced immediately after the operation and left in position for forty-eight hours, and then changed, or cleansed and re-inserted, as the case may be. Whichever is used, it should in no way act as a plug or interfere with the natural drainage of the nose, and it should be permanently removed as soon as possible.

Prevention of Sepsis.—There are three principal points to be remembered in the prevention of sepsis, namely, to protect the wound, to maintain natural drainage, and to keep the parts clean. Of course it is impossible to dress the wound and render it proof against the invasion of micro-organisms, as can be done after an external operation, and it is therefore better to allow the blood-clot, which soon forms over its surface, to act as a natural protection, and not to insert any form of dressing. During the formation and consolidation of the clot, that is, for the first twenty-four hours, the wound must be protected from atmospheric impurities by the insertion of some cotton wool into the vestibule of the nostril.

In order that natural drainage may be maintained it is most important not to plug the nasal fossa after operations. This may sometimes be necessary for the arrest of haemorrhage, and occasionally after operations for deviated septum, but whenever possible it should be avoided. There is no doubt that septic troubles are more often due to plugging and the consequent retention of discharges than to any other cause. The third indication, namely, that of keeping the parts clean, is carried out by means of nasal washes.

The ordinary routine treatment after minor intra-nasal operations performed under local anaesthesia is therefore as follows: Immediately after the operation the patient should sniff a little cold alkaline or sanitas lotion up the nostrils in order to arrest the haemorrhage and to wash out any loose clots; a piece of cotton wool is then inserted into the vestibule of the nostril, and changed frequently should there be any continued bleeding; when this has ceased the nasal cavity should not be interfered with for twenty-four or forty-eight hours, so as to allow the clot on the surface of the wound to consolidate; the wool can then be removed from the nostril and an examination made. If the wound looks healthy and there are no signs of adhesions, the patient should use the Coll. Alkalimum gently night and morning, followed by a spray of the Nebula Menthol. If there are any loose clots of blood in the nostril they should be removed by gentle syringing (p. 29). Occasionally blood-stained crusts, which on separating may leave some excoriation, continue to form on the site of the wound for a long time after the operation. This is often a source of considerable annoyance to the patient, but the continued use of Coll. Alkalimum and Nebula Menthol or Nebula Hydrargyri Nitratis (p. 50) will generally get over the difficulty. In some cases cleansing the wound and coating it with atomised vaselin (p. 33) is very successful.

The Arrest of Haemorrhage.—If the simple sniffing of cold lotion is not sufficient to arrest the bleeding after the operation, the patient should lie down with the head raised, and cold must be applied to the face and nose by means of lint saturated with cold or iced water. He should be kept quite quiet, avoiding all movements, and restraining any desire to cough or sneeze until the bleeding ceases. If in spite of this the bleeding continues and assumes a more serious character, or recurs after a longer or shorter interval, small pieces of ice must be slipped into the wounded

nostril from time to time and allowed to melt there, whilst ice is also given by the mouth. Instead of this the nostrils may be syringed with iced water, to each pint of which a teaspoonful of salt and an ounce of hazelin, if at hand, should be added. If the bleeding still persists and arises from the anterior part of the septum or inferior turbinal, local plugging combined with pressure is generally sufficient. A plug of wool or gauze is introduced and applied to the bleeding spot, and then the nose is tightly compressed between the finger and thumb for five or ten minutes. If the blood is coming from a point farther back or from the middle turbinal regions, local plugging may be tried, but as it is not possible to combine pressure with this, it is not so successful. If this treatment fail, the bleeding vessel must be sealed with a dull red cautery point. If the cautery is not obtainable, a 10 per cent. solution of supra-renal extract may be applied on a plug of cotton wool and left in position for fifteen minutes, but cautery is preferable, as the supra-renal extract is sometimes followed by a recurrence of the haemorrhage.

In very severe or persistent cases it may be necessary to pack the whole of the affected nasal cavity. This, however, should only be undertaken as a last resource, for, as already pointed out, it is extremely liable to be followed by septic troubles, and moreover the bleeding very often recurs on removal of the plug. Packing is thus carried out: The left forefinger is introduced through the mouth and post-nasal space into the posterior choana of the affected side, and retained there to prevent the packing from escaping into the naso-pharynx. The end of a long narrow strip of cyanide gauze is next taken in a pair of long-bladed nasal forceps, introduced through the anterior nares, and carried back until it comes in contact with the left forefinger. The gauze is then gradually packed into the nostril until the whole cavity is filled. This packing should not be allowed to remain in the nose for more than twenty-four or forty-eight hours, and great patience must be exercised in its removal for fear of renewed bleeding. The gauze should be played upon the whole time by a syringe containing a solution of bicarbonate of soda in hot water in the proportion of a teaspoonful to a pint, and no force whatever must be used in extracting it. If available, a Cooper Rose's bag may be used instead of packing. It consists of a soft collapsible india-rubber bag attached round a piece of tubing, to which a stop-cock is affixed (Fig. 52). The bag is introduced in a flaccid state

through the anterior nares, and carried back till it is just within the post-nasal space. It is then blown up as hard as possible, and the stop-cock turned. Such a contrivance has many advantages over packing the nostril with gauze; for instance, its introduction is easier for the surgeon and less disagreeable to the patient, and its removal is painless and less likely to be followed by renewed haemorrhage.



FIG. 52.—
Cooper Rose's
bag.

In some cases of very obstinate bleeding, whether post-operative or spontaneous, it may be necessary to pack the post-nasal space as well as the anterior nares, but this method should only be adopted quite as a last resource, as it very greatly increases the chances of septic troubles, and especially of suppurative otitis media. It is generally carried out by means of a tampon of lint with two long strings attached. A soft catheter is passed through the nose into the mouth, and to this one string of the tampon is tied and withdrawn through the nose. The tampon is pulled into position with this string, and then tightly packed into the naso-pharynx with a finger passed through the mouth. The string from the nose and that from the mouth are then tied together, and the anterior nares are packed with gauze. An alternative method is to introduce a sponge, with a tape firmly attached, through the mouth into the post-nasal space and to fasten the tape to the cheek with adhesive strapping. This, combined with packing the nasal cavity with gauze, is generally sufficient and is simpler, less painful, and less dangerous than a lint tampon. The plug or sponge as the case may be should be removed as soon as possible, in no case being left in longer than forty-eight hours. Its removal may be assisted by gently syringing the nares with a solution of bicarbonate of soda (1 dr. to 1 pint).

Post-Nasal Operations.—Generally speaking, the less the treatment the better are the results. As a rule nothing is necessary for the first week, but it may then be advisable, if there is much discharge coming either from the anterior nares or from behind the soft palate, to use the alkaline nasal wash gently two or three times daily until the discharge ceases. If the breath becomes offensive this must be commenced earlier, and occasionally it is

advisable to swab out the naso-pharynx with a mild antiseptic such as boro-glyceride. The danger of acute otitis media should always be remembered, and consequently the nose and post-nasal space should be cleansed with great care. Sniffing from the hand or a spoon is the safest method, but if syringing is necessary it must be done very gently and slowly (p. 29). If recurrent haemorrhage occurs it must be treated on the lines already suggested as suitable after intra-nasal operations (p. 72), plugging being avoided if possible.

Pharyngeal Operations.—After minor operations in the pharynx, such as cauterisation, removal of the uvula, and tonsillotomy, it is advisable to keep the parts washed with some mild antiseptic, such as permanganate of potash solution (p. 47), or sanitas used as gargles or sprays. The patient should also be instructed to eat nothing hot and nothing solid for the first twenty-four hours.

Laryngeal Operations.—After such operations as the removal of growths, or the curetting of ulcers, there are certain general indications for treatment which chiefly aim at the prevention of excessive inflammatory reaction. The voice must be rested as completely as possible for the first three or four days, and ice constantly sucked for the first twenty-four hours, after which steam inhalations of compound tincture of benzoin should be used night and morning until the wound is healed (pp. 51-2). Every precaution must be taken against contracting an acute catarrh. Special indications for after-treatment may be necessary in certain cases, but these will be mentioned under the various diseases in which they may arise.

II. EXTERNAL OPERATIONS

Laryngotomy, tracheotomy, intubation, and thyrotomy will be described here, as they are constantly alluded to in the text. The reader is referred to books on general surgery for the details of the more extensive external operations which may be required for the removal of tumours occurring in the nose, pharynx, and larynx.

A. LARYNGOTOMY

Laryngotomy, or opening the larynx through the crico-thyroid membrane, is only suitable for adults, as in early life there is not sufficient room for the tube in the crico-thyroid space. It is also

unsuitable for cases in which the artificial opening will have to be maintained for long periods, because the tube will be in close proximity to the cords, which consequently are liable to damage. The operation can be performed with extreme rapidity, and it is therefore indicated in dyspnoea of great urgency, such as may occur from the impaction of foreign bodies in the upper part of the larynx or occasionally from spasm of the cords. It is also indicated as a first step in extensive operations on the jaws, tongue, tonsils, or pharynx, so as to permit of plugging the lower parts of the pharynx to prevent blood from entering the larynx and lungs (Bond).

The Operation.—When performed for acute dyspnoea, the skin is frozen with chlor-ethyl or an ether spray if at hand, but when performed as a preliminary to other operations a general anaesthetic



FIG. 53.—Laryngotomy tube and pilot.

should be given. The head is then thrown back by means of a sand-bag placed under the neck, and the exact position of the thyroid and cricoid cartilages having been defined, the larynx is steadied and the skin gently stretched between the fingers and thumb of the left hand, whilst an incision $1\frac{1}{2}$ inch long is made in the median line with its centre over the crico-thyroid membrane. If the case is urgent this incision may be carried down, in the first instance, to the membrane, which should then be defined with the left forefinger and incised in the transverse direction immediately above the cricoid, that is, as far from the vocal cords as possible. The tube (Fig. 53) is inserted as quickly as possible, and fixed in position with tapes tied round the neck. If there is no hurry the incision should be gradually deepened, and the vessels met with tied, as they sometimes give rise to troublesome haemorrhage until their engorgement is relieved by opening the larynx. In opening the crico-thyroid membrane care must be taken that the incision is carried through the laryngeal mucous membrane, otherwise the tube may be pushed down in front of it without relief to the dyspnoea.

B. TRACHEOTOMY

In children tracheotomy is indicated for the relief of dangerous dyspncea due to acute conditions, such as simple acute laryngitis or diphtheria, and for chronic laryngeal obstruction, such as that due to papillomata. In adults it is indicated for dyspnoea arising in the course of acute infections, such as septic laryngitis or acute perichondritis, and for all forms of laryngeal stenosis, where the necessity for wearing the tube is likely to be prolonged or permanent. It is also indicated for the removal of foreign bodies below the cords, and as a preliminary to such operations as complete or partial extirpation of the larynx.

The question of a general anaesthetic is often difficult to decide, and will depend very greatly upon the skill of the anaesthetist and the dexterity of the operator. If both are thoroughly conversant with the emergencies which may arise, it may be said that for children a general anaesthetic should be given if the child is vigorous and generally in a good condition, whereas a local anaesthetic is better if the child is prostrate or becoming cyanosed. In the case of adults general anaesthesia is indicated when the operation is undertaken for the relief of chronic dyspnoea or as a preliminary step to a laryngectomy, whereas a local anaesthetic should be used in cases which are urgent from the outset or in chronic cases which have become urgent. As a local anaesthetic freezing the skin with an ether or chlor-ethyl spray will generally be found sufficient, though some surgeons inject cocaine.

The Operation.—The trachea may be opened either above or below the isthmus of the thyroid. The higher operation is generally performed unless there are special indications, such as the extension of a new growth into the trachea, calling for the lower opening. The low operation is often difficult owing to the depth of the trachea from the surface, and it may be complicated by troublesome venous haemorrhage, by the presence of the thymus gland or a large thyroidea ima artery, or by the innominate artery crossing the trachea unusually high up.

The tracheotomy tube should be angular as in Durham's (Fig. 54) or in Parker's (Fig. 55) and not a segment of a circle as in Fuller's, the lower end of which is apt to injure the anterior wall of the trachea. The selected tube should be as large as can be comfortably fitted into the trachea, and sufficiently short to prevent any great length of tube protruding from the wound in the neck.

All the necessary instruments should be boiled and placed in a tray containing some 1 in 60 carbolic lotion before the patient

is in any way moved, so that they may be ready for use should the breathing become worse at any moment. The patient is then placed on the table and, a thoroughly good light being secured, general or local anaesthesia is induced.

If the dyspnoea is very severe, the upper end of the operating table should be raised until the patient is almost in the sitting posture, and in this position the operation must be performed as quickly as possible. If no proper operating table is at hand, it should be carried out with the patient leaning back in a chair. If the dyspnoea is less urgent, the patient

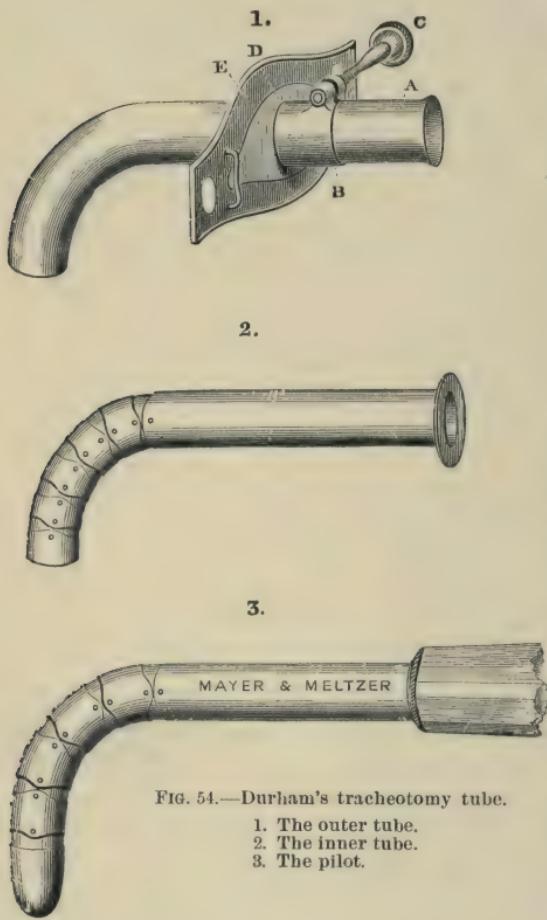


FIG. 54.—Durham's tracheotomy tube.

1. The outer tube.
2. The inner tube.
3. The pilot.

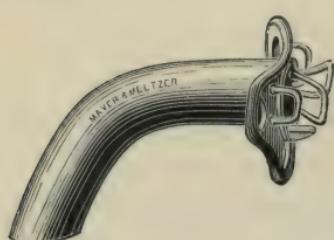


FIG. 55.—Parker's tracheotomy tube.

may be placed flat on the table and his head extended by placing a sand-bag under the lower part of the neck, which makes the operation easier. The head should be steadied and kept in the median line by an assistant standing at the top of the table, who also takes charge of the retractors and

separates the edges of the wound when called upon to do so. A second assistant stands on the left of the patient ready with sponges to keep the wound clean, whilst a

third should be at hand to control any struggling which may occur.

The surgeon then locates the cricoid cartilage, steadies it and the trachea with his left hand, and makes an incision through the skin and subcutaneous fat, commencing over the cricoid and extending downwards in the exact middle line for two inches. The interval between the sterno-hyoids is then exposed, and these muscles are separated with the blunt dissector and then held apart with the retractors, great care being taken that they are pulled equally away from the middle line. If any big veins are now seen they should be clamped in two places and divided, or, if they are accidentally cut, their ends should be clamped, always providing that there is no hurry. If the need is urgent, the trachea must be found and opened without waiting to arrest the haemorrhage, which will soon cease when free respiration is established. If there is no such urgency the incision is gradually deepened until the isthmus of the thyroid is seen, when a transverse incision is made through the fascia at the lower edge of the cricoid cartilage. The isthmus can then as a rule be pulled down out of the way, but if it is unusually high or is not easily pulled down, it should be clamped on either side of the middle line and divided. All the fascia covering the first four rings of the trachea having been divided and the trachea being well in view, the point of the knife is introduced below the third ring of the trachea with the cutting edge pointing upwards, and the third, second, and first rings are divided exactly in the middle line, whereupon there should be a rush of air through the opening. The tip of the left forefinger marks the incision, a Durham's tube is introduced, and the pilot withdrawn. A little skill is required in introducing the tube. The pointed end of the pilot should be inserted whilst the handle is held outwards at a right angle to the side of the neck. The handle is then swept round to the middle line and at the same time raised towards the chin. If the operation is done for diphtheria it may be advisable to put dilators into the wound in the trachea for a few minutes before inserting the tube, so that membrane may be the more easily expelled.

After opening the trachea and inserting the tube, one of two things may happen. The patient may take one long deep inspiration and cease breathing for what appears to be quite a long time. This need cause no anxiety, as respiration will recom-

mence without undue delay. On the other hand, the patient may be seized with the most violent and distressing paroxysms of coughing. If the operation has been performed for diphtheria, or for the removal of a foreign body, this should not be interfered with as it helps to expel the membrane, and may expel the foreign body, but under other circumstances it is best checked, as it is very exhausting. It can generally be controlled by spraying a little 10 per cent. solution of cocaine through the tube into the trachea.

Finally, one or two sutures are generally advisable in the lower part of the wound and should now be inserted. The tube should be fastened in position by tapes tied round the neck and the wound dressed with gauze or boracic lint cut so as to encircle the tube. A single layer of gauze suspended over the tube will prevent the expectoration or membrane from being expelled broadcast.

C. INTUBATION

This operation is employed as a substitute for tracheotomy chiefly in children suffering from some form of acute laryngitis or diphtheria. It is extensively practised in America and more on the Continent than in England, where its use has by no means become general. Tracheotomy, though in some cases difficult, is after all an operation which a sound knowledge of anatomy and of general surgical principles should make possible to every qualified practitioner. Intubation, on the other hand, undoubtedly requires a special training and dexterity, such as is not attained in the ordinary curriculum.

Putting aside this general consideration, intubation has the following disadvantages: during its performance respiration is directly interfered with, therefore it must be done with extreme celerity; oedema of the laryngeal mucous membrane may render the passage of the tube extremely difficult; if undertaken for diphtheria, membrane may be pushed before the tube into the trachea, causing complete obstruction and the necessity for immediate tracheotomy; the tube may be passed into the oesophagus, and by pressing on the larynx increase the dyspnoea; the mucous membrane may be lacerated from undue force or lack of skill; swallowing is always difficult when the tube is in position, which may lead to the patient's taking insufficient nourishment; liquids frequently pass through the tube into

the air passages and may cause broncho-pneumonia; if the tube becomes blocked with membrane or secretion, it is very apt to be expelled and the patient may be asphyxiated unless the surgeon is at hand to re-introduce it; finally, ulceration of the larynx or trachea is not infrequently caused by the tube, if worn for more than twenty-four hours.

The advantages of intubation are that in experienced hands it can be accomplished in only a few seconds; that no anaesthesia is required; that consent is easily obtained from patients or their parents; that breathing continues *per vias naturales*; that there is no wound to be poisoned; that the after treatment is very much simpler.

In children under five years of age the percentage of recoveries is greater after intubation than after tracheotomy, but, as pointed out by Watson Williams, this is due in part to the fact that intubation is performed earlier and in less severe cases than is tracheotomy, which is often left until the child is moribund.

To sum up this question, it may be said that tracheotomy is probably the safer and better method except in specially trained hands, and that even then intubation should only be undertaken when the patient can be kept under constant supervision, so that the tube may be promptly replaced should it be expelled.

The Operation.—The instruments required are a set of O'Dwyer's tubes of varying sizes with a gauge plate, an introducer,

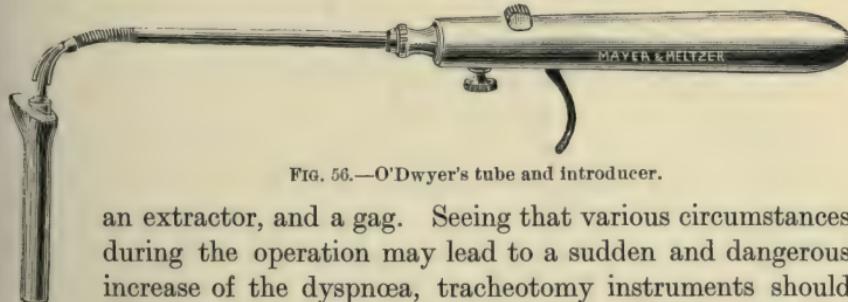


FIG. 56.—O'Dwyer's tube and introducer.

an extractor, and a gag. Seeing that various circumstances during the operation may lead to a sudden and dangerous increase of the dyspnoea, tracheotomy instruments should always be at hand and ready for use. The child is wrapped in a blanket to restrain his movements, and firmly held in an upright position by a nurse. An assistant standing behind introduces the gag and keeps the head steady, whilst the surgeon passes his left forefinger over the epiglottis and defines the upper aperture of the larynx. The tube, previously threaded and fixed to the introducer (Fig. 56), is then passed along the inner side of the left forefinger in a down-

ward and slightly forward direction, keeping it in the middle line. In this way it should be possible to slip it into the larynx. Its position can be ascertained by the forefinger, which should be able to feel the posterior wall of the larynx behind the tube. If it seems to be in the right position the tube is steadied with the finger and the introducer detached and withdrawn. If it is in the larynx a fit of coughing generally ensues, when air should pass freely through the tube. If the dyspnoea is not relieved, the tube is probably in the oesophagus and should be at once withdrawn with the thread and a fresh effort made to place it in the larynx. If the breathing is satisfactory the gag is withdrawn, and the thread is fastened to the side of the cheek with strapping, so that the tube can be easily withdrawn at any moment. It ought never to be left in longer than absolutely necessary. Some surgeons recommend dividing and withdrawing the thread, and removing the tube, when the time arrives, with a special extractor. This, however, puts the child to a great deal of unnecessary discomfort and is by no means easy.

D. THYROTOMY

The details of this operation and its after-treatment have been carefully worked out by Butlin, whose methods are here advised.

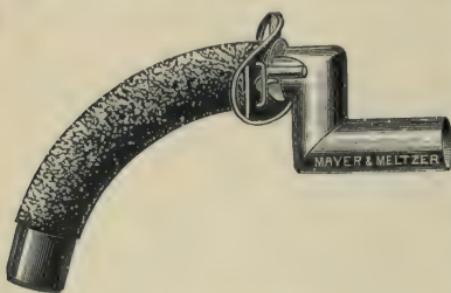


FIG. 57.—Hahn's tube.

The patient, and the skin of the neck, having been prepared in the usual way, a general anaesthetic is administered, and the patient's head thrown back by raising the shoulders and neck. An incision is made in the exact middle line from the hyoid bone to about an inch above

the sternum, and the structures divided right down to the thyroid cartilage and trachea, including the isthmus of the thyroid gland. Haemorrhage is arrested by clamping the divided vessels with pressure forceps, and the trachea is then freely opened and a Hahn's tube with its sponge covering (Fig. 57) is introduced. An interval of some ten minutes must now be allowed, so that the sponge on the tube may swell to the utmost and completely fill the space between the tube and the tracheal

walls in order that blood and lotions may be prevented from reaching the lungs. During this interval any big vessels which have been divided may be ligatured and the small ones twisted. The thyroid cartilage is then split in the middle line from below upwards with a knife, or if the cartilage is ossified, with saw or bone forceps. By keeping absolutely in the middle line and by working from below upwards the risk of injuring the vocal cords is reduced to a minimum. By working from above downwards the inner blade of the forceps or the point of a knife is very apt to catch and split one of the cords, which is followed by permanent damage to the voice, a serious accident in those cases in which the further steps of the operation do not necessitate interference with the cords. In addition to the thyroid cartilage the whole of the crico-thyroid membrane should be divided in the middle line below and a portion of the thyro-hyoid membrane above, so that the larynx may be widely opened. A silk thread is then passed through each edge of the divided cartilage, with which the wings of the thyroid are pulled apart as far as possible. The interior of the larynx is sponged dry and a solution containing 10 per cent. of cocaine and 5 per cent. of supra-renal extract is applied to the mucous membrane to arrest all oozing, and then a careful examination of the condition of the interior of the larynx is made. The next steps depend on whether the larynx has been opened for the removal of a simple or malignant new growth, for dissecting away cicatricial bands or adhesions, or for the removal of necrosed cartilage or a foreign body, the special indications for doing all of which will be suggested when discussing these various morbid conditions.

When the interior of the larynx has been dealt with according to circumstances, and the haemorrhage has been arrested, the alæ of the thyroid cartilage are brought together with a couple of silk sutures in as exact apposition as possible, and the upper part of the divided soft tissues and skin are united. The Hahn's tube is removed, but the soft parts over the wound in the trachea are left open, so that blood and other liquids may readily escape from the larynx and trachea. If the operation has been undertaken for laryngeal stenosis a special tube must be inserted into the trachea with a metal plug passing up into the larynx (p. 165).

After-Treatment.—The dangers of thyrotomy are septic infection of the wound and septic pneumonia due to blood, food, or discharge, reaching the lung. To avoid these complications

Butlin considers the following points important : (1) The Hahn's tube should be removed as soon as the operation is completed, and when possible no other tube employed in its place ; (2) the wound should be covered with gauze kept in place by a single turn of a bandage and changed as soon as it gets soiled ; (3) iodoform powder should be insufflated into the larynx either through the mouth or through the wound for the first few days ; (4) the patient should lie well over on his side, his head supported by a single low pillow in such a position that all liquids may run out through the operation wound ; (5) no food should be given through the mouth for twenty-four hours after the operation, rectal feeding being resorted to if necessary ; (6) after twenty-four hours the patient must make an attempt to swallow, but this should be done very carefully. The dressings should be removed from the wound and the tracheotomy tube taken out, if one is being used. The patient must lean well forward with his head lowered and slowly swallow sips of cold water, whilst careful observation is made to see whether there is any escape of the fluid from the wound in the neck. If none escapes, milk, beef tea, and other liquids may be given by the mouth, but if for any reason there is difficulty in swallowing, tube feeding must be carried out until water can be swallowed without its escape from the wound.

SECTION II

COMPLICATIONS OF THE UPPER RESPIRATORY TRACT IN RELATION TO GENERAL MEDICINE

THE pathological changes which may occur in the nose, pharynx, and larynx in the course of diseases coming under the head of general medicine are fairly numerous. Frequently they are quite subsidiary in importance to the disease on which they depend, though occasionally they are of such a grave nature as in themselves to endanger life or, at all events, seriously to affect the prognosis of the case. Even when of comparatively subsidiary importance the local symptoms may greatly add to the discomfort of the patient, and for this reason require treatment; moreover, their existence may in many instances throw much light on diagnosis. It seems, therefore, desirable to devote a section to the local complications in relation to more general diseases. When the symptoms are of relatively trivial importance, they will be little more than enumerated, and reference will be made to other sections for the method of treatment; whereas when the local condition gravely affects the general they will be fully discussed. This section may be advantageously arranged as follows:—

- I. Complications occurring in Acute Specific Fevers.
- II. Complications occurring in Chronic Infective Diseases.
- III. Complications occurring in Organic and Constitutional Diseases.

CHAPTER IV

COMPLICATIONS OCCURRING IN THE COURSE OF SPECIFIC FEVERS

I. MEASLES. II. SCARLET FEVER. III. SMALLPOX. IV. TYPHOID FEVER.
V. INFLUENZA. VI. WHOOPING-COUGH. VII. DIPHTHERIA.

THE upper respiratory tract may be involved in the course of any of the acute specific fevers, but especially in measles, scarlet fever, diphtheria, typhoid fever, and influenza. As a rule the complication has no special features peculiar to the fever which causes it, but almost any of the acute affections described under rhinitis, pharyngitis, and laryngitis may occur. It may be useful to summarise the conditions which are most likely to arise during each of the specific fevers.

I. In **Measles** acute catarrhal inflammation of the mucous membrane is an integral part of the disease. In the prodromal stage the chief changes are seen in the pharynx and consist of a dark red congestion of the mucous membrane of the lateral and posterior walls and of the pillars of the fauces, accompanied by dryness. Koplik has described bright red spots with raised white centres as occurring on the mucous membrane of the lips and cheeks, which he considers a common and pathognomonic sign of measles. Although such spots are diagnostic of measles when they do occur, they are frequently absent. After twenty-four hours from the commencement of these prodromal symptoms, acute rhinitis occurs and a rashlike redness may sometimes be seen in the pharynx accompanied by increased secretion. The skin eruption usually appears from twelve to twenty-four hours after nasal symptoms, but it may be delayed as late as the fourth day, and in the meantime there may be a remission of all the catarrhal symptoms, which, however, return with increased vigour when the rash does appear. The rhinitis is generally very intense, and is accompanied by violent sneezing and a profuse discharge from the nose ; the temperature rises to 102° or 103° F. (38.9° to 39.4° C.) or higher ; there is marked suffusion of the conjunctivæ

and free lachrymation. These symptoms help to distinguish rhinitis due to measles from simple acute catarrh.

Accompanying the acute rhinitis, or perhaps more often following it in the course of a day or two, there is almost invariably laryngitis of greater or less severity. There may be only patchy congestion, with hoarseness and a hard croupy cough, which symptoms quickly subside ; but occasionally the inflammation is of a severer type, leading to great swelling of the mucous membrane and consequent dyspnoea. In children spasmodic laryngitis (p. 489) is a common and early complication. Finally, when the rash begins to fade membranous inflammation of the fauces, larynx, and trachea may occur. It is generally true diphtheria, and is a very serious and often fatal complication (Washbourn).

Much relief may be given to the patient by treating the local symptoms on the lines suggested for acute catarrhal rhinitis, pharyngitis, and laryngitis.

II. In **Scarlet Fever** the first symptom is generally a sore throat, which precedes the rash by twenty-four or forty-eight hours. In an ordinary mild case there is a characteristic bright red coloration with slight swelling of the soft palate, fauces, and tonsils, accompanied by the typical "strawberry" tongue. In severe attacks the coloration is deep red or almost violet, at first uniform but later patchy. There is marked œdema and swelling of the mucous membrane and some enlargement of lymphatic glands. These inflammatory conditions of the throat generally subside, but sometimes a streptococcal infection occurs leading to acute septic pharyngitis (p. 419), often spoken of as scarlatinal angina. Streptococcal infection differs widely in severity, but is always attended with danger to life. Three grades may be described, though no sharp line can be drawn between them.

1. The mildest form is characterised by a yellow exudation from the crypts of the tonsil, which gradually forms a false membrane, generally limited to the tonsils, from which it is easily detached. Quite a superficial ulceration may occur beneath this membrane, but it heals readily and leaves no scar. The submaxillary glands become considerably enlarged, but generally subside quickly.

2. The second grade of severity may start at any time from the commencement of the fever until desquamation is well established, or it may supervene in the course of three or four days on the milder form just described. There is a sudden further

rise of temperature, accompanied by great pain in the throat, with rapid and considerable enlargement of the lymphatic glands, which become so painful as to render movements of the head almost impossible. A yellow membrane forms on the tonsils and pillars of the fauces, which tends to spread with astonishing rapidity to the naso-pharynx and nasal cavities, and occasionally downwards into the larynx. Extensive phagedænic ulceration may then occur, leading to loss of tissue, which sometimes involves the large arteries of the neck and may cause death from haemorrhage. From the nose there is a thin purulent discharge, very offensive and intensely irritating. In the larynx membranous inflammation is rare, the exudation being thin and semi-fluid, but occasionally acute oedematous laryngitis, perichondritis, and abscess formation complicate the case (Chap. xxii.). Stenosis of the larynx may result, necessitating operative interference or the permanent wearing of a tracheotomy tube.

3. A malignant form of infection may also occur, which is characterised by most profound septic poisoning, and by extremely rapid destruction and sloughing of the pharyngeal and nasal structures with swelling, breaking down, and sloughing of the glands of the neck. It is invariably fatal, death occurring from the seventh to the tenth day from its commencement.

The above affections differ from diphtheria in two points : (i) that Klebs-Loeffler bacilli cannot be found, and (ii) that paralysis does not occur as a sequel. Cases of double infection are occasionally met with, in which diphtheria bacilli are present, and after which paralysis may occur, but they are rare. Diphtheria, however, as a sequel to scarlet fever is by no means uncommon, and usually commences during convalescence.

Treatment.—The preliminary sore throat requires no energetic treatment; but seeing that the angina which occurs later is probably due to septic infection, it is as well always to cleanse the throat with some antiseptic, such as solution of perchloride of mercury (1-2000), used as a spray or by means of swabs, as recommended for diphtheria (p. 95). If severer complications occur they must be treated on the lines detailed in other parts of this work. (See Acute Septic Pharyngitis, p. 419, and Acute Septic Laryngitis, p. 494.) If acute oedematous laryngitis occur, tracheotomy may be necessary at any moment.

III. In **Variola** the nose, pharynx, and larynx are always more or less affected. In the prodromal stage there is an apparently

simple catarrhal inflammation of the mucous membrane, leading to slight swelling and redness, and often causing hoarseness, lachrymation, and sneezing. From the third to the sixth day the eruption may make its appearance in the nose and pharynx, and may even extend to the larynx, trachea, and bronchi. The pocks are at first seen as red patches, but they quickly break down and cause ulcers, two or more of which may coalesce and lead to large ulcerating areas. In haemorrhagic variola, ecchymosis of the mucous membrane is fairly common. Occasionally the ulceration extends deeply, and in the larynx may lead to acute oedema, abscesses, perichondritis, and necrosis (Chap. xxii.), all of which leave considerable scarring and sometimes pseudo-paralysis due to fixation of the crico-arytenoid joints. Membranous laryngitis is rare, but has been observed.

In **Varicella** the rash commonly spreads to the pharynx, and occasionally to the larynx. It generally clears up without any serious complications, but cases are recorded in which severe attacks of dyspnoea have necessitated tracheotomy. In one case, which ended fatally, ulceration of the cords was found post-mortem.

IV. In **Typhoid Fever** complications of the upper air passages are fairly common. The following may be met with :—

1. *Epistaxis*.—This is very common at the commencement of the disease, and is often profuse. If accompanied by a rise of temperature and headache without obvious cause, epistaxis should always suggest the possibility of typhoid fever.

2. *Catarrhal Symptoms*.—These generally occur early in the course of the disease, and may affect any part of the upper respiratory tract, but on the other hand their appearance may be delayed until about the sixteenth day. In either case the affected part has a great tendency to undergo early superficial ulceration.

3. *Ulceration*.—Both superficial and deep ulcerations are fairly common complications of enteric fever. In 2000 autopsies conducted in Munich, ulceration was found in 107 instances, most commonly on the faucial pillars, the aryteno-epiglottic folds, the vocal processes, and occasionally on the ventricular bands. Superficial ulcers are small and shallow, with a yellow floor very like herpes. They are usually multiple, and often coalesce forming large irregular ulcers, quite superficial and without any surrounding inflammation, and on healing they leave no scars. The deep form of ulceration may be very destructive.

4. *Acute Perichondritis*.—This somewhat rare complication is generally due to a primary infection of the perichondrium, but in a few cases it may be secondary to infection through an ulceration caused by pressure of the cricoid on the vertebral column. Perichondritis occurring in the course of typhoid fever is generally extensive and extremely likely to result in necrosis, followed by marked cicatricial contractions and adhesions, should the patient survive. (See Chap. xxii.)

5. *Acute Oedematous and Membranous Pharyngitis and Laryngitis*.—These conditions are comparatively rare in typhoid fever, but, when they do occur, may cause sloughing and subsequent stenosis.

6. *Progressive Laryngitis*.—A rather less acute though steadily progressive form of laryngitis may occur as a late sequel to typhoid. It is characterised by extensive infiltration, destructive ulceration and marked oedema, which occur most frequently about the arytenoids and more especially on their under surface. The chief symptoms of this complication are hoarseness and increasing difficulty in phonation and respiration. The dyspnoea nearly always necessitates a tracheotomy, in spite of which the termination is usually fatal.

7. *Paralyses*.—These are fairly common, being probably due to peripheral neuritis of toxic origin. Unilateral or bilateral abductor paralysis and occasionally complete paralysis of the recurrent laryngeal nerve may occur, whilst the soft palate may sometimes be simultaneously affected. The prognosis of such cases is good (Chap. xxiv.).

V. *Influenza*.—Inflammatory affections and neuroses are the usual complications of influenza.

Inflammatory Affections.—Acute rhinitis generally occurs at some period of the disease. Very often it is the earliest and most marked symptom, and runs the course of an ordinary acute catarrhal rhinitis. In recent epidemics, however, it has more often occurred towards the end of the febrile stage, the first and second stages of the acute catarrh being so short as to be hardly noticeable; whilst the third stage has been marked and prolonged and accompanied by an extremely profuse discharge of very thick muco-purulent secretion from the nose and nasopharynx, and generally from the trachea and larger bronchi as well. This condition does not readily yield to treatment, and is peculiarly apt to result in polypi, acute and chronic inflammation

of the accessory cavities, and ear complications. Epistaxis often occurs during the early stage of the acute rhinitis of influenza.

In the pharynx a generally distributed acute inflammation of the mucous membrane usually occurs; whilst acute lacunar tonsillitis is not uncommonly met with, and occasionally acute peritonsillitis. In the lacunar variety the exudation often runs together, so as to form a false membrane.

In the larynx there is generally some acute catarrhal inflammation, which has a tendency to persist for long periods and to become chronic. Occasionally small white patches may be seen on the inflamed mucous membrane, due to necrosis of the superficial epithelium. In rare instances acute septic oedematous laryngitis occurs, which may lead to extensive ulceration, sloughing, and necrosis. This is an extremely fatal complication.

Neuroses.—Anosmia is very common after influenza, and occasionally parosmia is met with. Paralysis of the soft palate and constrictors of the pharynx has been noted, while paralysis of the vocal cords is of fairly frequent occurrence. Unilateral or bilateral abductor paralysis is the usual form. It occurs during the early stages of convalescence, and is due in all probability to peripheral neuritis. The prognosis is good. For the treatment see Chap. xxiv.

A most troublesome form of paroxysmal cough is a very common sequel to influenza. It occurs chiefly in children, but is by no means uncommon in adults. The character of the cough closely resembles that of whooping-cough, and indeed it is often extremely difficult to distinguish between them, especially in children, in whom the cough is often worse at night and sometimes accompanied by an inspiratory crow.

VI. In Whooping-Cough there is generally some laryngeal catarrh, which is aggravated by the cough. In very severe paroxysms of coughing haemorrhage may take place from the larynx, and epistaxis is of common occurrence. Oedema of the larynx has, according to Gottstein, been frequently observed.

VII. Diphtheria.—For an exhaustive description of this disease the reader is referred to books on general medicine, as there seems no more reason why diphtheria should be classified under diseases of the upper respiratory tract than should scarlet fever. In both there is a strong probability that the pharynx, and occasionally the nose or larynx, is the primary seat of infection, and that the general symptoms are due to absorption of toxins

formed there. In both, too, though the brunt of the disease may fall on the throat, it often happens that the severity of the general symptoms are out of all proportion to the local lesion.

Local Manifestations.—One of the essential features of diphtheria is a membranous inflammation, affecting in order of frequency the pharynx, larynx, and nose. Though membranous exudation may be due to other intensely irritant infections or to trauma, the Klebs-Loeffler bacillus is its most common cause. Speaking generally, the firmer and more like wash-leather the membrane and the closer its attachment to the mucous membrane, the more likely is it to be due to the action of the diphtheria bacillus ; but no great reliance must be placed on these signs, for cases of true diphtheria occur in which the false membrane is easily separable and almost creamy in consistency, and even in which no membrane exists at all, whilst on the other hand cases are seen in which a firmly adherent membrane is due to other causes. The clinical features of the case and the presence of the Klebs-Loeffler bacillus must finally determine the diagnosis.

In the Fauces the tonsils are most usually affected, but membrane may also be seen on the uvula, soft palate, or back of the pharynx. It is as a rule patchy, but in severe cases all these parts may be covered with one uniform sheet of membrane. The colour of the membrane varies considerably ; it is generally described as being like wash-leather, but in very acute cases it may be brownish-red or almost black owing to an admixture of blood. The surrounding mucous membrane is inflamed, swollen, and sometimes markedly œdematosus. Superficial ulceration is not uncommon, and occasionally extensive sloughing occurs, causing considerable loss of tissue. There is generally a peculiar and offensive odour of the breath, more evident in bad cases. The submaxillary and cervical glands are more or less enlarged and tender according to the severity of the attack. In very bad cases the glands become matted together and fixed by inflammation of the surrounding connective tissue. Extensive sloughing of the pharynx and great enlargement and matting of the glands are probably due to secondary streptococcal invasion.

The Larynx may be primarily affected, but very much more commonly it becomes involved in the course of faacial diphtheria. The laryngeal symptoms may, however, be the first to attract notice. At first there is a harsh metallic cough, quickly followed by loss of voice and commencing difficulty of breathing. The

dyspnœa may either gradually increase, leading to inspiratory stridor, cyanosis, and recession of the chest walls, or paroxysmal attacks of inspiratory dyspnœa may take place with intervals of comparative ease. The paroxysms, however, tend to increase in severity, and are accompanied by signs of asphyxiation, such as recession of the chest, cyanosis, restlessness, anxious expression, and cold sweats; and unless relief is given by tracheotomy the patient may die of asphyxiation or cardiac failure. These paroxysms are commoner in children, whereas the progressive form of dyspnœa is usually seen in adults. Extension of the membrane to the trachea, larger bronchial tubes, and finally to the smaller bronchi is not at all uncommon.

The Nose may be primarily infected with Klebs-Loeffler bacilli, but in this case the disease usually assumes a more chronic type and differs from ordinary diphtheria in many respects (see Membranous Rhinitis, p. 201). It may also be affected secondarily to the pharynx, in which case the disease generally runs a severe course. There is not always membrane, but an offensive, intensely irritating, purulent discharge, which often persists, causing excoriation of the alæ and upper lip, long after the pharyngeal symptoms have disappeared. The pus generally contains diphtheria bacilli, and the case must be considered infectious as long as they are present in the nasal discharge. If membrane forms in the nose, it is not always possible to see it, but shreds of membrane or even casts of the nasal cavities may sometimes be expelled by syringing and occasionally by blowing the nose.

The Constitutional Symptoms of diphtheria vary from those of slight malaise to those of most severe and profound toxic poisoning. The chief symptoms during the acute stage are rapid compressible pulse; moderate rise of temperature at first, often followed by a subnormal temperature; albuminuria, and early and marked prostration with signs of cardiac failure. If death occurs during this stage it may result from prostration or sudden cardiac failure due to toxæmia, or from asphyxia.

During the convalescent stage the chief sequelæ are asthenia and various forms of paralysis; death may occur from cardiac failure or from paralysis of the respiratory muscles.

Paryses usually commence from two to six weeks after the commencement of the disease. The soft palate is generally the part to be first affected, and frequently the only part. On

examination of the pharynx the palate is seen to hang forward and to be partially or completely immobile when attempts at phonation are made. The symptoms are difficulty in swallowing, regurgitation of fluids through the nose, and a very typical nasal voice. Sensation is also impaired or lost, so that the palate can be touched without exciting any reflex movements. The constrictors of the pharynx may also be affected, in which case there is increased difficulty in swallowing; and food, especially liquid, is likely to pass into the larynx and set up fits of coughing and possibly dyspnoea.

In the larynx there may be paralysis of the sensory nerve with or without motor paralysis. The abolition of sensation may have very serious effects by allowing food to enter and pass through the larynx, solids causing dyspnoea, and liquids pneumonia. If the motor nerves are affected there may be adductor paralysis with loss of voice, or abductor paralysis with alteration of voice, and, if bilateral, noisy inspiratory dyspnoea. Complete paralysis of the recurrent laryngeal nerve may also occur, but is nearly always confined to one side (see Chap. xxiv.).

Apart from these paralyses connected with the upper respiratory tract, other muscles may be affected in the following order of frequency: the ciliary muscles, the muscles of the lower limbs, the ocular muscles, the muscles of the trunk and neck, those of the upper extremities and those of respiration.

Paralyses may last from a few days to many months, but recovery almost invariably ensues unless the cardiac or respiratory muscles are seriously affected, or some accident happens, such as the entry of food into the larynx.

Treatment.—The usual treatment is first to inject antitoxin, and when this has been done, to keep the throat and nose clean, to support the patient's strength, to guard against cardiac failure, and if necessary to perform tracheotomy. Directly a definite diagnosis has been made, and even before, if the case is at all suspicious, antitoxin should be injected. It is most important that this should be done as near the onset of the disease as possible, and no time must be wasted in waiting for bacteriological reports. The dose depends to some extent on the strength of the serum supplied by the various manufacturers, and also on the severity of the disease. A single dose of from 2000 to 4000 units is usually sufficient, but in severer cases it may be repeated after an interval of four hours, should the condition of the patient

seem to require it. For the operation a syringe sufficiently large to hold the maximum dose, and constructed so that all its parts may be boiled, is necessary. In the case of children the needle should be connected to the piston by means of an india-rubber tube, so that no injury will occur should the patient move during the injection. The syringe is placed in a steriliser or a saucepan and boiled, and about three square inches of skin over the flank or abdomen are made as far as possible aseptic by washing with soap and water followed by 1 in 20 carbolic lotion, or perchloride of mercury 1 in 1000. The syringe is then removed from the steriliser and filled with the serum, and the skin is raised between the thumb and forefinger of the left hand whilst the needle is plunged quickly into the subcutaneous tissue with the right hand. The injection is then slowly made, the skin at the point of puncture being supported with the thumb to prevent the regurgitation of any fluid along the needle. Directly the whole dose is injected the needle is withdrawn, and the puncture is dressed with cyanide gauze fastened on by strapping. If these precautions are taken and the serum is pure, there need be no fear of a local abscess or other septic trouble. The syringe should be carefully washed and again boiled before being put away.

The injection of antitoxin has greatly done away with the necessity for local treatment, for it is found that after its use the membrane quickly separates and does not form again. It must be remembered, however, that the seat of the membrane is very liable to septic poisoning, and it is therefore advisable to keep the part washed with some detergent or antiseptic lotion. If the pharynx is affected and membrane is still present it should be sprayed or swabbed with the Nebula Alkalina (p. 31), and then painted with some disinfectant such as Pigmentum Resorcin, Pigmentum Boro-glyceride (pp. 40 and 55), or with a 1 in 1000 solution of perchloride of mercury. Chlorine water is also very useful. Goodall and Washbourne recommend irrigating the throat with saturated solution of borax, or with permanganate of potash (15 grs. to an ounce of water), by means of a Higginson's syringe, as being by far the most efficacious method of treating septic conditions of the throat.

If the nose is affected it should be frequently syringed with a mild antiseptic such as Collunarium Sanitas or Boro-glyceride (p. 29), or permanganate of potash (p. 47). If the larynx is affected separation of the membrane may be encouraged by placing the

patient in a tent in which the air is kept saturated with moisture by means of steam kettles.

The patient's strength must be supported by a plentiful and stimulating, though liquid, diet; milk, beef-tea, patent extracts of meat, and peptonised foods should be freely given, and solids commenced directly the condition of the throat permits of swallowing them. If the heart shows any tendency to failure, the patient must be kept strictly in the recumbent position, whilst alcohol and strychnine or strychnine and iron must be administered.

The question of tracheotomy is always a prominent one when the larynx is affected, and it is extremely difficult to decide if and when it should be undertaken. Speaking generally, the operation should be performed earlier and for less severe symptoms when the patient lives at a distance from a doctor than when the surgeon is at hand; but in no case should it be postponed if the dyspnoea is urgent and accompanied by restlessness, sweats, and marked recession, or if the patient shows the slightest sign of exhaustion or failure of the heart's action. It must be remembered that it is far better to operate too early, or even unnecessarily, than to allow the patient to become exhausted, in which case death often occurs in spite of the relief which tracheotomy gives. Intubation is sometimes practised in place of tracheotomy, but is only suitable when there is but little membrane and then only in specially skilled hands. The operation of tracheotomy is described on p. 77, and an account of the advantages, disadvantages, and method of intubation will be found on pp. 80 to 82.

CHAPTER V

COMPLICATIONS OCCURRING IN THE COURSE OF CHRONIC INFECTIVE DISEASES

I. COMPLICATIONS OF PHthisis: A. *Laryngeal Complications*. Pathological changes—Symptoms—Treatment, general and local. B. *Pharyngeal Complications*.—Pathological changes and treatment. C. *Nasal Complications*.—Pathological changes and treatment. II. LOCAL TUBERCULOUS LESIONS: A. *Lupus*. Of the Nose, Pharynx, and Larynx. B. *Chronic Retro-pharyngeal Abscess*.

In this and the following chapter the local manifestations of tuberculosis, syphilis, glanders, leprosy, and rhinoscleroma as met with in the upper air passages will be dealt with.

TUBERCULOSIS

The tuberculous diseases of the upper air passages are best classified as follows:—

- I. Lesions complicating phthisis or general tuberculosis.
- II. Local lesions, such as lupus or chronic tuberculous abscesses.

I. THE COMPLICATIONS OF PHthisis

It has always been a much-debated point whether tuberculosis, apart from local lesions, such as lupus, ever occurs as a primary disease in the upper air passages and especially in the larynx, or whether it is always secondary to pulmonary or general tuberculosis. Whilst it is true that the tuberculous lesions about to be described have occasionally been seen in patients in whom no physical signs can be observed in the lungs, it must be remembered that the disease in the chest may be well established before it can be detected by auscultation or percussion. The tubercle bacillus will however very usually be found in the sputum, and the subsequent history of the case will be confirmatory unless the disease is arrested. These affections therefore may be considered to be always secondary to phthisis or general tuberculosis, and are profoundly influenced in their character and course by these primary conditions.

Etiology.—Infection of the upper respiratory passages occurs probably in the large majority of cases from the bacillus-laden sputum which comes in contact with and lodges in the irregularities of the parts. The bacilli gain access to the lymph spaces through the ducts of the glands (Horne) or through abrasions, and possibly through damaged though unbroken mucous membrane. Simple lesions of the larynx are extremely common in phthisis, and may often be observed to precede the tuberculous lesion.

The lymphatics are undoubtedly the structures in which the disease starts, and the means by which it spreads in the larynx. Jobson Horne has demonstrated that in many cases bacilli are present in the lymphatic channels, and that the changes commence as a cell proliferation around these vessels. This observation agrees with the fact that tubercle is most common in those parts of the larynx most richly supplied with lymphatics, namely, the inter-arytenoid region, the arytenoids, and the epiglottis.

Complications in the upper respiratory passages are commoner in men than in women, and occur most frequently between the ages of twenty and thirty, though they are fairly common up to forty and may be met with at almost any age except in very young children. There seems to be no direct relation between the severity of the lung trouble and the occurrence or degree of the local complications. In every case impaired general nutrition, by diminishing the patient's resisting power to infection, is, of course, an important etiological factor.

A. Laryngeal Complications

Pathology.—The larynx is found to show some departure from the normal in about 80 per cent. of all cases of phthisis. Such abnormalities may be divided into two main groups: first, non-tuberculous lesions, that is, simple lesions not due to local infection of the larynx with tubercle bacilli; and, secondly, true tuberculous lesions. The various changes in the two groups may be further divided as follows:—

1. Non-Tuberculous Lesions.
 - (a) Localised patches of anæmia.
 - (b) Localised hyperæmia.
 - (c) Chronic laryngitis.

2. Tuberculous Lesions.

- (a) Miliary tubercle.
- (b) Single localised tuberculous tumours.
- (c) Subglottic oedema.
- (d) Limited infiltration with or without superficial ulceration.
- (e) Extensive infiltration with oedema, but without marked ulceration.
- (f) Deep destructive ulceration with or without marked oedema.

Lesions belonging to the first group occur in about 50 per cent. of phthisical subjects, and are due to the general disturbance resulting from the primary disease, or to irritation arising from the sputum or from the mechanical act of coughing. Their great importance lies in the fact that they weaken the local resisting power of the laryngeal mucous membrane, and open the way to direct tuberculous infection. True tuberculous lesions occur in about 30 per cent. of cases of phthisis. They have been divided as above for the purpose of description and to render "treatment" more intelligible, but it must be clearly understood that they are all stages of one process and may pass from one into another, and may even be combined.

1. NON-TUBERCULOUS LESIONS

(a) **Localised patches of Anæmia** are very common. They may be limited to the epiglottis, ventricular bands, or to one or more patches in other parts of the larynx, the intervening mucous membrane being healthy. Coursing over these anæmic areas small injected vessels may often be seen giving rise to a peculiar and characteristic appearance. The sensibility of these parts is often altered, generally being diminished, though occasionally exaggerated.

(b) **Localised Hyperæmia** may also occur in similar patches without any other signs of chronic inflammation. It especially affects the vocal cords, whilst the rest of the larynx may be anæmic.

(c) **Chronic Laryngitis** usually affects the whole organ, but may be limited to one portion, such as one vocal cord or one ventricular band. When thus localised it is of more serious import.

Not uncommonly there are abrasions or superficial ulcerations on the vocal cords, and more especially over their vocal processes; or the mucous membrane in the inter-arytenoid space is often thickened and boggy and on phonation is thrown into marked folds, whilst in the creases thus formed there may be some slight loss of tissue. In association with these affections attacks of acute laryngeal catarrh are not uncommon. Recent investigations by Horne and others point to the fact that, in some of the graver lesions here described, tuberculous infiltration has already commenced.

2. TUBERCULOUS LESIONS

(a) **Miliary Tubercl.**—This usually occurs as part of an acute tuberculosis, and is characterised by the presence of small, roundish,

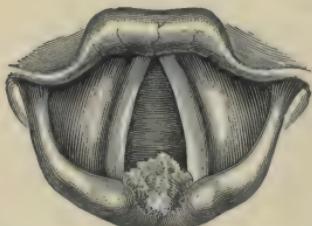


FIG. 58.—Localised tuberculous tumour.

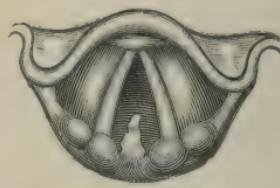


FIG. 59.—Localised tuberculous tumour.

millet-seed nodules of a yellowish colour, which are scattered widely in groups over the laryngeal mucous membrane. It is usually accompanied by a general translucent oedema, and the tubercles tend rapidly to coalesce, soften, and ulcerate.

(b) **Single Localised Tuberculous Tumours.**—These tumours are met with in the early stage of phthisis or in cases of very chronic lung disease, and when present usually constitute the sole local lesion. They are small rounded tumours with a somewhat pale surface and slightly oedematous appearance. The surrounding mucous membrane shows no signs of inflammation, but on the contrary is often somewhat anaemic. They generally remain unchanged for months or even years, but eventually break down and form ragged tuberculous ulcers, though occasionally they disappear spontaneously. Most commonly they spring from the inter-arytenoid fold (Figs. 58, 59, and 60) usually a little to one or the other side of the middle line, but similar tumours are more

rarely seen on the edge of the epiglottis, the arytenoid cartilages, and on the false or true cords (Fig. 61).

(c) **Subglottic Oedema.**—Another form of localised tumefaction

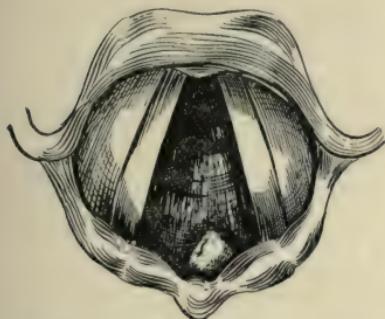


FIG. 60.—Localised tuberculous tumour.

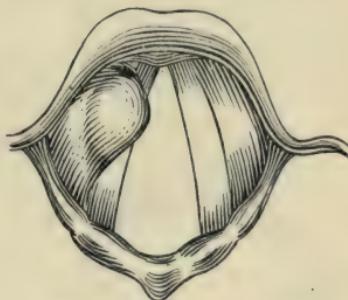


FIG. 61.—Tuberculoma of the ventricular band (after Avellis).

is known as subglottic oedema, which may occur alone or in association with other varieties of laryngeal tuberculosis. When found alone it accounts for some of the cases described as chronic subglottic laryngitis (p. 525). It is characterised by symmetrical infiltration of the under surfaces of the vocal cords, causing considerable swelling, and suggesting another pair of cords on laryngoscopic examination (Fig. 62). These infiltrations may be pale or congested ; they show little tendency to ulceration, but may cause considerable stenosis.

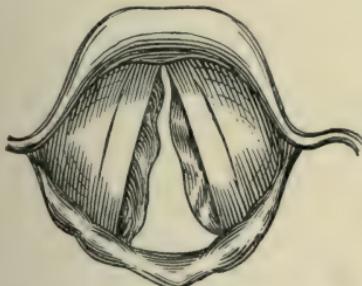


FIG. 62.—Tuberculous subglottic oedema.

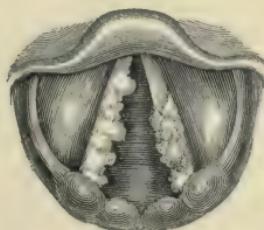


FIG. 63.—Early tuberculous infiltration and ulceration of the vocal cords.

(d) **Limited Infiltration with or without Superficial Ulceration.**—This is most usually met with when the tuberculous infection is limited to the intrinsic parts of the larynx, and consequently the cords and ventricular bands are most commonly affected. The following is a fairly typical picture of this stage : the epiglottis is very anæmic, with small veins coursing over its surface ; the

arytenoids are just sufficiently oedematous to obliterate their normal outline ; one cord is red and rounded with a rough uneven surface, and there may be quite a superficial ulceration over its vocal process. This picture may be varied by both cords being affected (Fig. 63), or by one or both ventricular bands being slightly swollen and sometimes superficially ulcerated (Figs. 64-66) ; or again there may be slight thickening in the inter-arytenoid region with

subsequent superficial ulceration, and later still, pale oedematous granulations overhanging and hiding its edge (Figs. 65 and 66). In rare instances the extrinsic parts of the larynx are affected and ulcers are seen on the epiglottis (Fig. 67), the aryteno-epiglottidean folds, or on the arytenoids. Limited infiltrations and superficial ulcers are generally unilateral and do not progress with any great rapidity.

FIG. 64.—Superficial tuberculous ulceration of right ventricular band and infiltration of left vocal cord.

(e) **Extensive Infiltration with Oedema.**—This is most commonly met with in the extrinsic parts of the larynx, and therefore usually affects the arytenoids, the aryteno-epiglottidean folds, and the epiglottis. The infiltration causes at first a simple, pale, translucent swelling of the mucous membrane, modifying the normal outline of the parts (Fig. 68), but as the disease advances there is considerable alteration in shape. The arytenoids and aryteno-epiglottidean folds become greatly enlarged and pyriform in shape (Fig. 69) ; if bilateral they completely hide the inter-arytenoid fold, and render approximation of the cords mechanically impossible (Fig. 70). The epiglottis becomes turban-shaped and may almost completely hide the interior of the larynx from view (Fig. 71). Small yellowish tubercles may sometimes be seen in this oedematous translucent membrane, which after a time caseate and break down, causing multiple superficial ulcers (Fig. 72, p. 104). These may coalesce and form large, irregular, yellowish-grey-coloured ulcers with a worm-eaten appearance.

(f) **Deep and Destructive Ulceration.**—The stage of infiltration sooner or later passes on to the stage of deep and destructive ulcer-

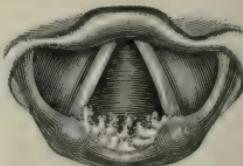
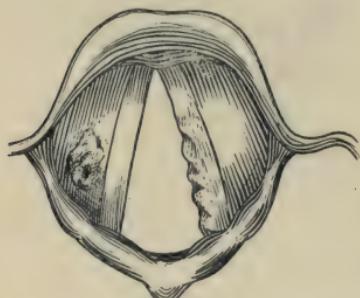


FIG. 65.—Tuberculous granulations.

tion, which is the final condition of all unarrested cases. If the upper part of the larynx be affected there is usually great oedema, but in the lower parts the ulceration may extend deeply, while the cartilages may be affected, and even necrosed, without the occurrence of much swelling. The epiglottis may become ragged,



FIG. 66.—Granulation in inter-arytenoid region and infiltration and ulceration of right vocal cord.



FIG. 67.—Superficial tuberculous ulcers of the epiglottis.

or be completely destroyed, and the arytenoid bodies may be extensively ulcerated, their cartilages becoming necrosed (Figs. 73 and 74). Perichondritis of the thyroid or cricoid cartilages may occur, resulting in fixation of the cords, and ultimately leading to necrosis or the formation of an abscess, which may either burst into the larynx or burrow into the neck. (See Chronic Perichondritis, Chap. xxiii.) In these conditions the larynx is filled with a white, viscid mucous secretion or a profuse discharge of pus, which greatly adds to the distress of the patient.

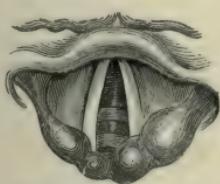


FIG. 68.—Early oedematous infiltration round left arytenoid.

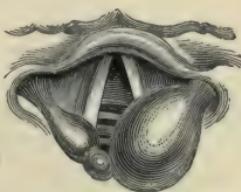


FIG. 69.—Edematous infiltration of left aryteno-epiglottidean fold, pyriform in shape.

Symptoms.—The local symptoms of laryngeal tuberculosis may be quite unimportant and consist chiefly in alteration of the voice and a little expectoration; but, on the other hand, they may be very serious and distressing. The following are the more important:—

1. *Painful Deglutition.*—This may be due to the passage of food over ulcerated surfaces, or simply to the movements of the larynx during deglutition. At times it is so severe that swallowing becomes almost impossible, and rapid loss of flesh ensues.

2. *Dyspnoea*.—This is due to subglottic oedema or very extensive swelling of the supra-glottic region, both of which conditions are fortunately rare.



FIG. 70.—Bilateral oedematous infiltration of aryteno-epiglottidean folds.

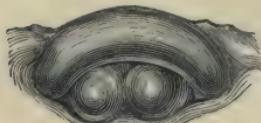


FIG. 71.—Oedematous infiltration of epiglottis and arytenoids.

swelling, which mechanically prevents the approximation of the cords, perichondritis, ankylosis of the crico-arytenoid joint, paralysis from pressure on the recurrent laryngeal nerve, or swelling and ulceration of the cords themselves.

Diagnosis.—This is generally easy, but occasionally tuberculosis of the larynx has to be distinguished from simple chronic



FIG. 72.—Oedematous infiltration with superficial ulceration.



FIG. 73.—Extensive deep and destructive tuberculous ulceration.

laryngitis, from pachydermia of the inter-arytenoid region, from the various forms of tertiary syphilis, and from malignant disease. In differentiating tubercle from chronic laryngitis and pachydermia (Chap. xxiii.) the pallor of the mucous membrane, the tendency to slight oedema, and the disproportionate loss of voice are factors in favour of tuberculous disease. In cases simulating syphilis the diagnosis has often to be based on the results of the treatment. Iodide of potassium will benefit syphilitic cases, but as a rule

aggravates tuberculous troubles. Again, in cases simulating malignant disease, where operative treatment seems suitable and the patient is willing to submit to it if necessary, a piece of the growth

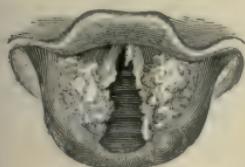


FIG. 74.—Destructive tuberculous ulceration of ventricular bands and cords.

should be removed for microscopical examination (p. 578). In every case the chest should be carefully examined, and the tubercle bacillus must be repeatedly sought for in the sputum. It must be remembered that the expectoration is often so profuse when the larynx is affected, that it is extremely difficult to find the tubercle

bacillus by the ordinary methods.

Prognosis.—The prognosis depends partly on the general condition of the patient and on the extent and activity of the disease of the chest, and partly on the character of the local lesion.

In miliary tuberculosis, in extreme oedema with destructive ulceration, and in perichondritis, a fatal termination must be expected within three months to one year. On the other hand, in local tuberculomata and in superficial ulceration without much infiltration the prognosis is fairly good, provided the lung disease is quiescent or in quite an early stage.

TREATMENT

1. Non-Tuberculous Lesions.—Before considering the treatment of tuberculous lesions of the larynx, a few words may be said about preventive treatment, that is, about the treatment of the non-tuberculous lesions so frequently met with in the larynx in cases of phthisis. These lesions are extremely important, as has already been said, because they open the door to infection from the sputum, and consequently energetic and thorough treatment should always be adopted.

In the first place, the general treatment appropriate to phthisis with laryngeal complications, as about to be detailed, should be carefully followed. If possible open-air treatment at a sanatorium should be carried out, and at all events suitable hygienic conditions must be insisted upon. Local measures may also be adopted. Thus in *localised anaemia and hyperæmia* it may be useful to brush over the mucous membrane with a solution of perchloride of iron (1 dr. to the ounce), or chloride of zinc (10 grs. to the ounce). Great caution, however, is necessary in using paints for fear of

bruising the larynx (p. 41). If the patient is restless or nervous, it is better to use these solutions by means of a spray (p. 32). The Vapor Pini Sylvestris or Vapor Creosoti (p. 53) are also very beneficial in these conditions, and, if used carefully (p. 51), are free from danger. Moreover, they can be used by the patient at home, whilst, if necessary, the painting or spraying may be simultaneously carried out once or twice weekly by the surgeon. In *chronic laryngitis* the treatment prescribed for ordinary chronic laryngitis (p. 515) must be promptly commenced and systematically carried out, especially if there are any abrasions or superficial ulcers, in which case the use of Vapor Creosoti (p. 53) and the application once a week of a solution of lactic acid (50 to 60 per cent., or stronger if necessary) are especially valuable. If an acute attack of laryngitis supervene, as is not uncommon, the patient must be carefully treated on the lines suggested for simple acute laryngitis (p. 486) until the inflammation has completely subsided. For instance, he should be confined to bed in a warm room, and steam inhalations, such as the Vapor Benzoini (p. 52) should be used every four hours; whilst excessive cough must be checked by insufflations of morphia or by other means (p. 126).

In all cases, however slight the lesion, absolute rest of the voice is most important, and entire silence must be enjoined. If simple lesions are not to become tuberculous, too much stress cannot be laid upon this point.

2. Tuberculous Lesions.—It is convenient to describe the treatment of laryngeal tuberculosis under the headings of (A) General, (B) Local, and (C) Symptomatic. The general treatment is required in all cases; the local treatment will vary with the local condition; and the symptomatic may be required at any time.

A. General Treatment.—Laryngeal lesions being always secondary to disease of the lungs, general treatment is in every case of the utmost importance, and should be commenced at once and carried out simultaneously with local treatment. It should be directed towards improving and maintaining the patient's general health, so as to place him in a better position to resist any further invasion of tubercle bacilli. For this purpose the following points will require attentive consideration:—

- (1) Open-air treatment.
- (2) Hygiene and climate.
- (3) Diet.
- (4) General medicinal treatment.

1. Open-Air Treatment.—It is now universally recognised that a constant supply of pure air combined with careful sanitation and personal hygienic measures, as at present practised and taught at the various sanatoria, is the best method of increasing the patient's resisting power to the spread of the tuberculous process and of arresting the disease. It is beyond doubt that a great measure of success has attended this treatment of pulmonary tuberculosis; and it only remains to inquire whether disease of the larynx is a contra-indication to living in the open air, and whether the local condition can be expected to improve under such treatment. So far as can be judged at present open-air treatment has no deleterious effect on the laryngeal condition: it does not cause oedema nor attacks of acute laryngeal catarrh, and so does not give rise to the necessity for tracheotomy. The existence, therefore, of laryngeal complications does not contra-indicate this method of treatment. On the other hand, it must be admitted that it does not seem in itself to influence advanced laryngeal conditions beneficially to any marked degree. Early cases of slight infiltration with or without superficial ulceration will often get well, but in all the more severe forms, though the general condition of the patient will improve, the larynx will usually remain stationary. It is therefore advisable that local treatment should be employed simultaneously, and, when this can be done, treatment at a sanatorium may be strongly recommended. In short, this combination of methods affords the best possible chance of recovery.

2. Hygiene and Climate.—Patients are not always able or willing to shut themselves up in a sanatorium for many months, in which case other methods of improving the resisting power must be recommended. In the first place, the patient should live in the healthiest possible surroundings, obtaining as much fresh air as possible, and carefully avoiding stuffy, ill-ventilated, or smoky rooms, which are injurious both to the general health and to the local condition. Bad sanitation and all other influences likely to depress the general health must be carefully guarded against.

Speaking generally, change of air, wintering abroad, and, occasionally, sea voyages, can be recommended to those who can comfortably afford them, but great caution must be exercised in selecting both suitable patients and suitable places. Patients for whom local treatment is likely to be of benefit should of course remain within reach of a laryngologist, and those in whom either the local or general conditions are far advanced or rapidly

advancing are much better at home. Rapid loss of flesh, diarrhoea, dysphagia, persistent haemoptysis, and laryngeal dyspnoea are all obvious contra-indications against travelling. Broadly speaking, dusty, smoky, or excessively dry places are to be avoided. The seaside is generally suitable, and there are many places on our own east and south coasts which answer all the requirements and have the advantage of being within the pecuniary reach of most patients. On the east coast anywhere between Cromer and Margate is suitable to those who require a bracing air, whilst the south coast may be recommended to those who prefer a less stimulating climate. Many places on the north coast of Cornwall are also very suitable.

If the patient can afford to leave England, a sea voyage in the Mediterranean or a cruise up the Nile may be recommended to those who have a healthy appetite and are not likely to be upset by the monotony and other disadvantages of the diet on board ship. It is, however, most important that the patient should avoid ill-ventilated cabins and smoking-rooms, and that he should spend all day in the open air and, if possible, sleep on deck at night. Much harm has been done by indiscriminately advising sea voyages.

As places of residence for those who are able to winter abroad Pisa, Capri, Madeira, Teneriffe, Algiers, and Tangiers are all suitable, having an equable temperature and not being too dry or dusty. The high-lying plains of South Africa are not especially suitable for laryngeal cases, as most of them are dry and apt to be dusty, and this also applies to the Dowling Hills in Queensland so much recommended in phthisis pulmonalis. Many of the mineral springs appear useful, but probably the benefit is derived from the rest, climate, and nourishment quite as much as from the waters. Amongst such places may be mentioned Ems and Gleichenberg. On returning home it is advisable to make a short stay at some intermediate place, so as to avoid too sudden a change of temperature and climatic conditions. For this purpose Montreux, Lugano, and Arco on Lake Garda may be recommended. Amongst the places which are contra-indicated on account of the dust may be mentioned Cannes, Nice, and Egypt, except on the Nile. Davos and other places of like altitude are said by most authorities to be unsuitable for laryngeal phthisis on account of the dryness of the air and the great difference between the mid-day and evening temperature. Derschied, however, maintains that he has had

some excellent results from residence at Davos, and Clinton Wagner recommends the Colorado Springs. They consider the prejudice against high and dry places unjustifiable, but think that the patient should be indoors by sundown and that whilst out of doors the mouth should be kept absolutely closed, thus enforcing nasal respiration.

3. Diet.—The patient must, of course, lead an absolutely regular life, avoiding all excesses and taking meals with the utmost regularity. The diet should be limited to everything simple and nutritious, and yet it must be as varied as possible. Milk in any form, eggs, meat, fish, oysters, tripe, sweetbreads, plenty of cream and butter, and any delicacy which the patient may fancy, so long as it is digestible, may be given in turn. Good and palatable cooking is most important. Rich sauces, meat twice cooked, pastry, and confectionery must be avoided. Milk, and fats in the shape of cream and butter, are a very appropriate form of nourishment, and are largely in use at most sanatoria, three pints of milk, and additional cream if desirable, being given daily. Unfortunately, however, many tuberculous subjects have, or soon acquire, a marked dislike for them. Such patients can often be persuaded to take at least a quart of milk a day by introducing it into various articles of diet; for instance, half a pint of milk can often be taken and appreciated as milk tea, made by infusing tea with boiling milk instead of boiling water, or it can be agreeably introduced into a great variety of cooked foods, such as soups, fish purées, minced chicken, stewed rabbit, tripe, sweetbreads, puddings, and soufflés. Malted foods are very beneficial, and plasmon in some instances is useful, especially if the laryngeal condition is complicated by tuberculous peritonitis. Raw meat is strongly recommended by Philip and some patients do extremely well on it, but it is always distasteful and often upsets the digestion. A little alcohol well diluted is often beneficial and sometimes even necessary; it not only acts as a general tonic and a heart stimulant, but tends to lower the temperature and aid the digestion. A very small quantity of whisky or brandy (a teaspoonful with 30 drops of glycerin, and if there is much cough or dysphagia, from 2 to 5 drops of tincture of opium) given immediately before meals often assists the patients to take their food with relish and comfort. When marked dysphagia is present there are special indications for diet which will be considered under symptomatic treatment.

4. Medicinal Treatment.—It is impossible to lay down any

routine medicinal treatment for phthisis; each case must be treated according to its special indications, but errors of digestion, cardiac weakness or irregularity, night sweats, diarrhoea, and other morbid conditions may have to be corrected in the first instance. Later, tonics are indicated to improve the general nutrition and resisting power of the patient, whilst combined with tonics certain drugs which seem to exercise some influence in directly controlling the tuberculous process may be given. Some patients will respond more quickly to an acid tonic, whilst others will take an alkaline with greater advantage. The following are examples of useful mixtures, any one of which should be taken three times a day after meals:—

R.	Citrate of iron and ammonium	10 gr. = 0.69 gm.
	Solution of arsenic	3 m. = 0.19 c.c.
	Tincture of nux vomica	5 m. = 0.31 c.c.
	Carbonate of ammonium	3 gr. = 0.21 gm.
	Water	to 1 oz. = 30 c.c.
R.	Sulphate of quinine	1 gr. = 0.07 gm.
	Solution of strychnine	5 m. = 0.31 c.c.
	Spirit of chloroform	10 m. = 0.62 c.c.
	Dilute phosphoric acid	10 m. = 0.62 c.c.
	Water	to 1 oz. = 30 c.c.
R.	Tincture of nux vomica	5 m. = 0.31 c.c.
	Bicarbonate of soda	5 gr. = 0.34 gm.
	Aromatic spirits of ammonia	15 m. = 0.94 c.c.
	Compound tincture of cinchona	30 m. = 1.87 c.c.
	Water	to 1 oz. = 30 c.c.

If the patient be anæmic iron is of course indicated. To get its full effect with the least disturbance to the digestion, fifteen drops of tincture of perchloride of iron should be taken in a tumblerful of water, immediately before meals. If it cause any tendency to constipation, which it seldom does when taken in this dilute form, a teaspoonful of sulphate of sodium should be given every morning before breakfast in hot water. Glycerophosphates and hypophosphites given after food are also useful tonics, and the malt extracts and cod-liver oil improve the general nutrition. If the patient rebels against fats, cod-liver oil should be commenced in doses of half a teaspoonful and cautiously increased. If it upsets the digestion and causes loss of appetite it must be abandoned. Stearn's wine of cod-liver oil, which is said to con-

tain no fat but all the active principles of the oil, is an excellent substitute and is easily tolerated.

Of the drugs recommended for especially combating the tuberculous process nothing seems to be so good as creosote or its derivative guaiacol. If this drug is carefully administered in increasing doses it has a marked effect in arresting the progress of the disease both in the larynx and in the lungs. Beech creosote is the best form, but it is most important that it should be freed from all impurities. At first doses of one minim are given three times daily immediately after food; in three or four days these doses are doubled, and then increased week by week by one or two minims until ten, fifteen, or even twenty drops are being taken after each meal. It is best tolerated in a mixture such as the following:—

R.	Creosote	1 to 20 m. = 0·06 to 125 c.c.
	Rectified spirit of wine . . .	30 m. = 1·87 c.c.
	Liquid extract of liquorice . .	30 m. = 1·87 c.c.
	Powdered tragacanth	q.s. q.s.
	Water	to 1 oz. = 30 c.c.

It may also be given combined with cod-liver oil (1 to 20 m. of creosote in a teaspoonful to a tablespoonful of the oil). Some patients prefer it in capsules, but it is very doubtful whether such concentrated doses are as readily absorbed, and they may even injure the mucous membrane of the stomach. During its administration the bowels must be carefully regulated, and special care must be taken to avoid upsetting the digestion by errors of diet. If there are any signs of an upset, the drug must be left off for twenty-four hours; as a rule, tolerance will soon be established. Beech creosote contains over 60 per cent. of guaiacol, and this is often substituted for creosote as being pleasanter to the taste and less likely to upset the digestion. Camphorated guaiacol is especially useful when there is profuse expectoration. When neither creosote nor guaiacol can be tolerated, arsenic in increasing doses, alone or combined with iron, will occasionally be of service. It should, of course, be given immediately after food.

Koch's tuberculin (T.R.) has of late been more extensively tried, chiefly for the more chronic forms of tuberculosis, such as lupus and tuberculous glands or joints. It is claimed by Wright and his followers that its administration can be so guided by watching the opsonic index that harmful reaction can be

avoided. There are at present no recorded statistics on which to form an opinion as to its utility. It has apparently been followed by good results in lupus, but until further investigations have been made, it would seem unwise to use it in the more active forms of tuberculosis such as occur in the lungs or larynx.

Koch's original tuberculin and Liebreich's cantharidinate of potassium have had their trial, but have proved valueless. Marmorek's antitoxin seems likely to be attended with no better results.

B. Local Treatment.—Before considering the local treatment of the special forms or stages of tuberculous disease, it will be as well to discuss briefly the question of intra-laryngeal surgical operation for the relief of tuberculosis of the larynx, as there is still much difference of opinion on this question.

The pioneers of this treatment were Krause and Heryng, who showed (as far back as 1886) that tuberculous ulcers were curable by means of curettement and the application of lactic acid, and all who have since practised such methods are able to record many instances of prolonged relief and even occasionally of cures. Nevertheless there are many opponents of such active interference. Schrötter objects to it because the larynx is extremely likely to be re-infected from the lungs, and Stoerk opposes it because he considers the improvement only temporary, and because surgical interference with the extrinsic parts of the larynx increases the dysphagia and adds to the patient's distress. Others again have observed increase of lung trouble with rapid wasting or general tuberculosis. That such cases have occurred cannot be doubted, but it is not quite certain that these ill effects were directly due to the local treatment. Heryng considers they were coincidental, and that they would have occurred even if no surgical treatment had been adopted. This naturally is beyond the possibility of proof. Finally, there are undoubtedly some cases in which the laryngeal condition has been made worse by surgical measures.

These differences of opinion and varying results seem to be due to the views which individual surgeons take as to the suitability of different cases for surgical interference, on the proper selection of which the whole question depends. In properly selected cases good results may be anticipated, in badly selected cases nothing but harm can ensue. In making a selection both the local condition of the larynx and the general condition of the patient must be most carefully considered. As regards the larynx

the first and most important question to decide is whether the local disease can be wholly eradicated. Surgical measures are justifiable only when the surgeon feels confident that he can remove the whole disease. As regards the patient's general condition, no active measures should be adopted locally, if the lung disease is either extensive or progressive, nor if there is rapid wasting, haemoptysis, fever, or other constitutional disturbances, nor if the patient is highly nervous, or old, or feeble.

Referring to the classification of the various tuberculous lesions met with in the larynx, it is evident that the cases most suitable for operation are localised tuberculomata, and limited infiltration with or without superficial ulceration. It is equally evident that the condition of being able to eradicate the whole disease cannot be fulfilled in miliary tubercle, extensive infiltration and oedema, nor in deep destructive ulceration with or without marked oedema. In practice, of course, cases will be met with not coming entirely under any one of these heads, in which the *pros* and *cons* as to suitability will have to be carefully weighed in the balance. Finally, given a local condition apparently suitable for operation, in a patient in comparatively good general health with quiescent lung disease, there are still one or two other factors to be taken into consideration before deciding to operate. It is essential that the surgeon should personally feel entire confidence in his ability to reach and remove the whole disease, which, it must be remembered, may be far more extensive than would appear from the picture in the laryngoscopic mirror. To do this often taxes the most skilful operator, especially when the larynx is unusually narrow, when the diseased area is partly concealed, when the epiglottis is deformed, or when the patient responds badly to cocaine anaesthesia. In the next place, the patient's age and surroundings must be considered ; for the younger the patient and the healthier his surroundings, the more likely will he be to benefit from surgical interference.

To summarise this question, it may be stated that the success of intra-laryngeal operations largely depends on the following factors :—

1. The local character and extent of the disease.
2. The general condition of the patient.
3. The condition of the lung disease.
4. The patient's age and surroundings.
5. The thoroughness of the operation.
6. The carefulness of the after-treatment.

If all these points are carefully attended to in the selection and treatment of cases, a fair measure of success may be expected ; but it must be remembered that a great many of the cases eminently suitable for surgical measures are just those which tend to get well under appropriate general treatment and without any but the simplest of local treatment. General and simple local measures should therefore always be given a fair trial before any operation is undertaken.

Having indicated the cases in which intra-laryngeal surgical measures may be adopted with hopes of success, the local treatment of the various forms or stages of the disease must now be described in detail.

1. Miliary Tuberculosis.—The treatment in these cases must be general and symptomatic, as active local treatment only worries

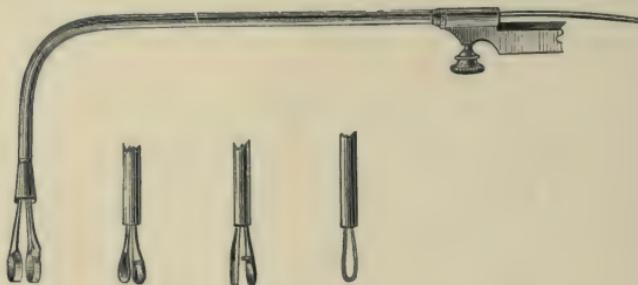


FIG. 75.—Krause's forceps and snare.

the patient and irritates the larynx. The general treatment must be on the lines already indicated, and the symptomatic consists chiefly in the relief of pain (p. 124). The affection runs a rapidly fatal course, and is little influenced by treatment.

2. Local Tumours.—These may remain in a stationary condition for very long periods extending from many months to years, and as already stated they have been known to disappear spontaneously. Nevertheless they are always a source of danger, for at any moment they may break down and cause not only much distress to the patient but an actual increase of the disease. It is indeed often astonishing how rapidly the whole larynx will become infected when once these tumours commence to ulcerate.

The patient must be kept under constant supervision, and the treatment must in the first instance be purely general (p. 106). If, however, the tumour show any signs of breaking down, active local measures are generally indicated. From what has already

been said it can be gathered that these tumours are very suitable for intra-laryngeal operation, provided of course that the patient's general condition is favourable, and that there are no contraindications (p. 112). It is most important to perform a complete removal and, if possible, at one sitting, otherwise a latent trouble may be stirred up into great activity, and the whole larynx may become infected in the same way as when the tumour ulcerates spontaneously. The larynx having been carefully anaesthetised (p. 65), the growth is removed by means of forceps, and the base is subsequently firmly scraped with a Heryng's curette, and a caustic such as lactic acid applied. The method of introducing instruments into the larynx has already been described (p. 67). Krause's forceps (Fig. 75) are generally the best for the purpose, but if the tumour is situated on the arytenoids or epiglottis, Lake's forceps (Fig. 76) will be found more suitable. If the growth stands out well and can be easily encircled with a wire loop, Krause's laryngeal snare (Fig. 75) may occasionally be used with advantage. In some instances the growth is of such a nature and so situated that neither forceps nor snare can be applied, in which case the whole removal must be effected by means of Heryng's curettes (Fig. 77). The instrument selected must be applied several times if necessary to make a complete removal. The base must then be dried and pure lactic acid or chromic acid applied (p. 118).

The after-treatment of these cases is very important. Everything must be done to encourage rapid healing of the wound, otherwise the surface may become re-infected with tubercle bacilli

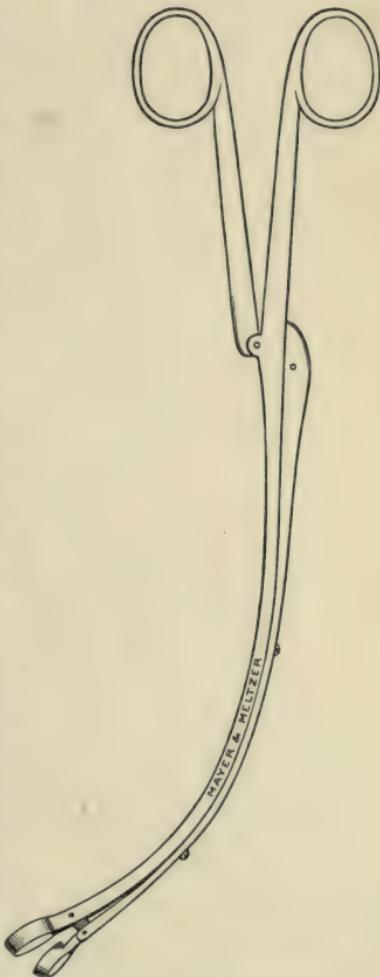


FIG. 76.—Lake's laryngeal forceps.

and an increase of disease result. The technique is the same as that recommended after scraping superficial ulcers (p. 120).

This line of treatment when thoroughly carried out is generally successful, and the prognosis, as far as the larynx is concerned, is good, as these tumours seem to be purely local and have but a slight tendency to recur.

Other Methods.—Electrolysis has been employed in these cases and is thought very highly of by some surgeons. It is, however, difficult of application and, to be effective, has to be applied for some minutes at a time. Patients can seldom, however, tolerate this, even after submucous injections of cocaine. The strength of the current should be from 15 to 20 milli-ampères.

The galvano-cautery has also been employed for the destruction of small tuberculous tumours, but it offers no advantages over removal with forceps, and is liable to be followed by much inflammation and oedema.

3. Subglottic Oedema.—In these cases but little local treatment can be carried out as the surface of the swelling is usually covered by intact mucous membrane, and it is a difficult region to reach through the mouth. Should ulceration occur, the active surgical measures recommended for limited ulceration (p. 119) are indicated in suitable cases. The great danger of this form of disease arises from the frequent necessity for tracheotomy. Should it be necessary to perform this operation in cases in which the other conditions are eminently favourable, that is, where the patient's general health is exceptionally good, where the lung disease is strictly limited or quiescent, and where the laryngeal affection is confined to the subglottic region, it may be advisable to extend the operation by dividing the cricoid and lower part of the thyroid cartilages, and to excise the affected parts. Such a combination of circumstances is, however, very rare.

4. Limited Infiltration with or without Superficial Ulceration.—In this stage local measures should always be adopted, and generally yield good results. The exact method of treatment will vary according to the conditions present in the larynx and with the patient's general health. They will be discussed under (A) Inhalations, Sprays, Insufflations, and Paints; (B) The Applications of Caustics; and (C) Surgical Measures.

(A) **Inhalations, Sprays, &c.**, are indicated in very slight cases of limited infiltration without breach of surface or with only superficial ulceration, and when severer measures are contra-indicated

on account of the patient's general condition. The following inhalations are amongst the most useful, the formulæ for which will be found on pp. 52-53, and directions for their use on p. 51.

Vapor Tincturæ Benzoini.

Vapor Eucalypti.

Vapor Pini Sylvestris.

Vapor Creosoti.

The benzoin inhalation being a sedative is useful to commence with, if there is any co-existent catarrhal inflammation. All the others are both antiseptic and stimulating, and in milder cases give great relief and may induce healing of superficial ulcers. Hot inhalations are contra-indicated if the patient is undergoing open-air treatment, and in this case the same remedial agents should be used as dry inhalations by mixing them with spirit (p. 53).

Should the larynx contain much secretion, cleansing by means of the alkaline spray (p. 31) must be adopted. It should be applied once daily by the surgeon, if possible (p. 31); but in some cases the patient may also be taught to use it (p. 51), so that the larynx may be cleansed two or three times a day.

Should the progress of the case be slow or unsatisfactory under treatment by inhalations, sprays must be substituted, which should, whenever possible, be applied by the surgeon. The following are the most useful :—

Borax	2 per cent. in water.
Chloride of zinc	2 per cent. in water.
Guaiacol	15 to 30 per cent. in almond oil.
Formalin	1 to 7 per cent. in water.
Menthol	3 to 6 per cent. in paroeline.
Hetol	2 per cent. in peppermint water or in 50 per cent. of alcohol.

The chloride of zinc is especially useful if there is any œdema, and the menthol solution where a mild anæsthetic is required. Formalin has been recently strongly recommended by Bronner.

As an alternative to sprays, should there be any ulceration, the insufflation of papaine will often promote healing of the ulcer. It should be applied daily, or even twice a day, for the first week or fortnight, and then every second or third day until the healing is complete. If the patient is unable to visit the surgeon, he should use the powder for himself by means of Leduc's insufflator (p. 55). In successful cases the purulent secretion and necrotic débris will gradually disappear, and be replaced by healthy granu-

lations with a tendency to heal. This method, if carefully carried out, sometimes gives very good results, and has the advantage of not unduly worrying the patient.

Finally, if there is ulceration, and healing is not obtained by any of the above measures, the applications of paints should be tried. As already pointed out, paints require very careful handling in tuberculous disease, for if the laryngeal mucous membrane is bruised or abraded during their application, an extension of the disease is extremely likely to occur. It is safer, therefore, in all cases first to cocaineise the larynx. Lactic acid (25 per cent. to 50 per cent.), menthol (2 per cent. to 6 per cent.), or the following paint applied every other day will all be found useful :—

R.	Creosote	12 m. = 0·71 c.c.
	Rectified spirit	2 dr. = 7·5 c.c.
	Glycerin	to 1 oz. = 30 c.c.

(B) **The Application of Caustics.**—Caustics are indicated in slightly severer cases of superficial ulceration or when the former methods have failed to give relief. They should, however, only be used when the general health is good and the lung affection slight or quiescent. The larynx should be thoroughly cleansed by means of an alkaline spray (p. 31) and cocaineised (p. 65), and the surface of the ulcer should then be thoroughly rubbed over with a pledget of wool soaked in pure lactic acid. This should be repeated as soon as the eschar separates, generally in from seven to ten days, and continued at intervals until the healing process commences. Three or four thorough applications of the pure drug are usually necessary, after which it may be sufficient to apply a 50 per cent. solution of lactic acid once a week. Should no progress be made under lactic acid treatment, one or two applications of pure chromic acid may be tried. The chromic acid crystals should be fused on the end of a laryngeal probe (p. 36) and rubbed over the surface of the ulcer under cocaine anaesthesia. It causes a marked superficial slough, which, on separation, usually leaves a healthy surface. The treatment may then be continued with lactic acid, first applied pure and subsequently in weaker solutions as above recommended. The patient must be kept under observation until the healing is complete, and all the precautions recommended after operative treatment should be adopted (p. 120).

Many other local caustics have been tried with some success,

such as phenol sulpho-ricinate (20 per cent. to 40 per cent.), and ortho- and parachlor-phenol (5 per cent. to 20 per cent. in glycerin). Generally speaking, however, lactic acid is by far the most active and sure application. Though of the nature of a caustic, if applied to healthy mucous membrane it produces no breach of surface, and is only followed by slight inflammatory reaction, whereas on the surface of an ulcer it causes distinct inflammatory action with the formation of a brown or yellow slough. If there be no inflammatory reaction after the application, no healing can be expected, and the application should not be repeated, but palliative treatment only adopted. This generally means that the case has been badly selected and the patient's resisting powers are so diminished that the tissues cannot react healthily.

(C) **Surgical Measures.**—Both intra-laryngeal and external operative measures have been adopted for the relief of this stage of tuberculosis of the larynx, and must here be discussed.

Intra-laryngeal Operations.—As already seen, cases of localised disease are among the most suitable of tuberculous affections of the larynx for surgical interference by intra-laryngeal methods. Nevertheless there is always some risk of causing increase of the disease both locally and generally, and of failing to procure healing. Operative measures should, therefore, never be undertaken until general and simpler local treatment have been given a very thorough and prolonged trial. If these means have failed and there are no contra-indications (p. 112), operative measures may be tried in cases where there is limited infiltration and oedema round an ulcer, or granulations on the surface of an ulcer, and also in cases where the simple application of caustics has failed to procure healing. They consist essentially in removing granulations and the surrounding oedematous infiltration, in thoroughly curetting the surface of the ulcer, and in afterwards applying a caustic such as lactic or chromic acid.

The larynx must be thoroughly anaesthetised by means of cocaine or cocaine and supra-renal extract. The instruments usually required are Heryng's curettes (Fig. 77, p. 120) and Krause's forceps (Fig. 75, p. 114); but Mackenzie's cutting forceps (Fig. 242, p. 566) and Lake's punch forceps (Fig. 76, p. 115) may sometimes be more useful. If much overgrowth is present, pieces of it should be first punched out or cut away, and subsequently the whole of the tuberculous area should be thoroughly

and firmly curetted. As much as possible having been done, the bleeding should be allowed to cease, the larynx mopped dry by means of cotton wool swabs, and pure chromic acid fused on the end of a laryngeal probe (p. 36) should be firmly rubbed into the raw surface. It is advisable, whenever possible, to remove the whole of the disease at one sitting so as to avoid taxing the patient's strength by repeated operations. When, however, this cannot be done, the operation may be repeated at the end of a week and even again after a similar interval, but it is rarely advisable to undertake this treatment when the whole disease cannot be removed in two, or at the most three, sittings. After the disease has been removed and the slough caused by the chromic acid has separated, a healthy granulating surface will usually be seen.

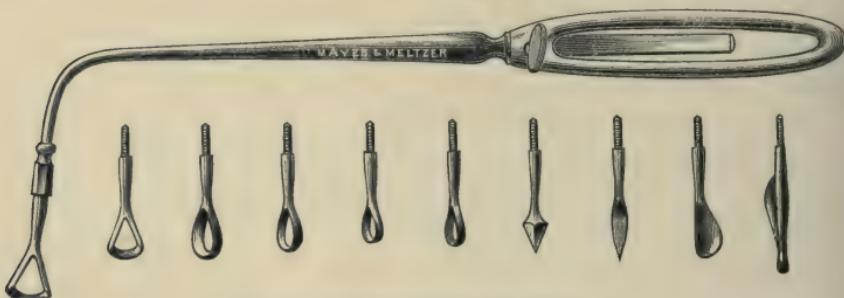


FIG. 77.—Heryng's curettes and knives.

The above method is especially suitable when the ulceration is situated intrinsically. In cases where the ulcer is on the epiglottis curetting may also be tried, but in practice it is often found to be extremely difficult to carry out owing to the mobility of the part. In such cases the ulcerated area should be removed, together with a little healthy tissue beyond it, by means of Lake's punch forceps. If the disease covers any considerable area it is easier and quicker to remove the whole of the upper part of the cartilage with the large cutting forceps recommended by H. Barwell (Fig. 78). To do this, local anaesthesia is induced, and the tongue is depressed so as to obtain a direct view of the epiglottis (p. 25). The forceps are then passed over the epiglottis, pressed well down on to the base of the tongue, and sharply closed.

The After-treatment requires considerable care. If these operations produce pain or dysphagia, insufflations of orthoform, to which an equal part of iodoform may be added, must be applied

daily by the surgeon himself. The constant sucking of ice is also very valuable for the relief of these symptoms. If after curetting much secretion forms and sticks in the larynx, the parts should first be thoroughly washed by means of an alkaline spray (p. 31) and the orthoform powder subsequently applied. After a week or so the after-treatment consists in lightly brushing the granulating surface about twice a week with pure lactic acid until healing is complete. As a rule this is not painful, but it is safer to anæsthetise the larynx with cocaine. In addition to this the general treatment must be carefully carried out; all speaking must be strictly forbidden and coughing prevented (p. 126), so as to give complete functional rest to the affected parts.

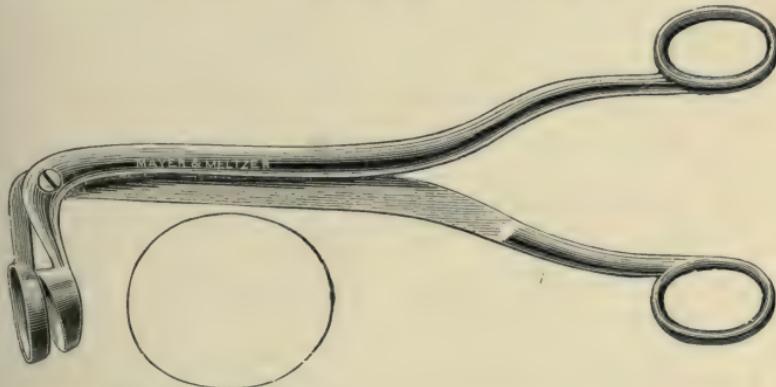


FIG. 78.—Barwell's epiglottis punch-forceps.

Complications and Prognosis.—Troublesome hæmorrhage may occasionally follow the operation, cases of which are reported by Heryng and Schmidt. Should this occur the local application of equal parts of lactic acid and Liq. Ferri Perchloridi has been recommended (Heymann). Where considerable laryngeal stenosis is present, the blood may fill up the larynx and tracheotomy may be required, but such cases are not really suitable for operative measures. Occasionally the operation is followed by febrile disturbances and loss of appetite, or the patient may be very much upset by the cocaine, under which circumstances the operation should not be repeated. When, however, the case has been well selected and the operation completely performed, the prognosis is good as far as the particular outburst of the disease is concerned. Healing is generally obtained, the voice is greatly improved, and the patient's spirits and general health are much benefited. The

mischief, however, is always likely to recur, and for this reason such patients should be inspected from time to time so that the slightest sign of fresh infection may be treated at once.

External Operations.—Thyrotomy has been recommended for the eradication of the disease at this stage. It has been performed a fair number of times and in some instances with good results. Occasionally it has been done with the direct intention of removing tuberculous disease, but more often, perhaps, under the impression that the affection was malignant. Crepon has collected twenty cases. In four, operation was followed by death from shock, and in four others by death from extension of the lung disease, although there was local improvement. In ten cases the results were encouraging. In one case there was no recurrence twelve months after the operation, and in another, the patient (a clergyman) was still able to do his work eleven years after the operation. Other reported cases show that the operation is attended with considerable danger. So far as can be judged, favourable results from thyrotomy seem to have occurred in just those cases in which equally favourable results would be expected from general treatment and intra-laryngeal methods. Seeing that thyrotomy carries with it very considerable risks, as shown by the eight immediately fatal cases out of the twenty collected by Crepon, it cannot be recommended.

5. Extensive Infiltration and Oedema without Marked Ulceration.—(a) **Intra-Laryngeal Methods.**—In these cases nothing but harm can result from surgical procedure or the application of caustics. They hasten softening and ulceration, and give an impetus to the lung disease. General treatment must therefore be mainly relied on, especially the administration of creosote (p. 111), local treatment being limited to inhalations, sprays, or insufflations. Paints are generally to be avoided for fear of bruising the mucous membrane and causing ulceration. The steam inhalations and sprays recommended for superficial ulceration (p. 117), may give some relief, and dry inhalations used by means of a respirator may be tried (Fig. 47, p. 53). The following may be especially mentioned :—

Oleum Pini Sylvestris	.	.	.	.	40 m. to the ounce of spirit.
Oleum Eucalypti	.	.	.	.	80 m. , , ,
Oleum Cinnamomi	.	.	.	.	120 m. , , ,
Creosote	.	.	.	.	80 m. , , ,
Menthol	.	.	.	.	16 gr. , , ,

From thirty to sixty drops of any of these should be placed in the respirator for each inhalation. They should be used several times a day.

The treatment may be varied by substituting insufflations. Boric acid, iodoform, dermatol, iodol, or aristol, either pure or mixed with starch, are all useful as insufflations. They should be applied daily by the surgeon after cleansing the larynx with an alkaline spray (p. 31).

Intra-laryngeal injections of menthol or guaiacol are thought by some surgeons to be more efficacious than the same drugs used as sprays.

Submucous injections have also been strongly recommended by Krause, Watson Williams, and Donelan in this stage of the disease. A solution of guaiacol (20 per cent.) has most often been used, but perchloride of mercury (1 in 1000), pyoktanin (2 per cent. solution), aristol (2 per cent. solution), creosote (10 to 20 per cent.), and menthol (20 per cent. in paroleine) have also been recommended. Donelan strongly recommends guaiacol for the relief of pain, while Heryng speaks highly of the injection of iodoform emulsion. The method, however, is not to be generally recommended, as the benefit is doubtful and the procedure causes the patient pain, discomfort, and mental anxiety.

The reduction of the oedema by means of scarification, or definite incisions into the infiltrated area, though at one time much practised, cannot be recommended. Such methods are not curative, they increase the chance of a fresh infection by injuring the mucous membrane, and the incisions may develop into tuberculous ulcers.

By means of general and simple local treatment material improvement may sometimes be attained. Very rarely indeed the larynx may return to an almost normal condition, but in the majority of cases the disease progresses and ulcers appear in the oedematous mucous membrane, so that palliative and symptomatic treatment alone become possible.

(b) **External Operations.**—*Partial and Complete Extirpation of the Larynx* have been performed for the relief of this stage of the disease, but the lungs being affected, even this extreme measure cannot eradicate the whole disease, and therefore such operations are not justifiable.

Tracheotomy has been advised as a therapeutic measure on the ground that the resulting physiological rest to the larynx and the relief from even slight dyspnoea has a marked beneficial

effect. It has been tried extensively, but it is now almost unanimously thought that the operation should be reserved for those cases where it is absolutely necessary to avert death from asphyxia. General experience shows that phthisical cases go rapidly downhill after tracheotomy, and that it should never be performed as a therapeutic measure. After the trachea is opened coughing becomes more difficult, and consequently the discharges in the lungs collect, cause irritation, increase the tuberculous process, and induce septic poisoning (Kidd). Further, tuberculous infection of the tracheotomy wound is very likely to occur and add to the sufferings of the patient. (For details of operation, see p. 77.)

6. Deep and Destructive Ulceration with or without Extensive Oedema.—In these cases relief of the most distressing symptoms is all that can be aimed at. The general and symptomatic treatment are, therefore, the most important (pp. 106 and 124). Creosote and camphorated guaiacol are the most useful drugs for internal administration, and the Vapor Creosoti (p. 53) and the Nebula Menthol (p. 44) may be used with advantage. Operative treatment is generally to be condemned, but if an abscess form, it should be opened, and occasionally semi-detached pieces of the epiglottis with the raw edges, resulting from destructive ulceration, must also be removed. Regular daily cleansing of the larynx with the alkaline or some other detergent lotion, followed by dusting the parts with orthoform or with equal parts of iodoform and orthoform, is in the majority of cases the most useful local treatment. The prognosis in these cases is, of course, extremely bad, and an early fatal termination is to be expected.

C. Symptomatic Treatment.—The most important symptoms to be relieved are dysphagia, pain, cough, and dyspnoea.

The *Dysphagia* is especially marked when the epiglottis or the arytenoids are affected, the pain varying directly with the extent and position of the ulceration. It will be found that semi-solids are most easily swallowed. Valentine's meat juice, Bovril, home-made beef tea, or clear mutton broth can be thickened with cereals, beans, peas, or potatoes; and meat jellies, cold extract of beef, eggs beaten up in meat tea, cocoa made with milk, fish purée, meat minced and passed through a sieve and cooked with milk, calves' brains, sweetbreads, and oysters may all be usefully included in the dietary. If even semi-solids cause pain the patient should be turned upon his stomach with his head hanging over the end of the bed and suck the nourishment through a glass

tube. In this position fluids are less likely to enter the larynx and cause violent paroxysms of coughing, and the act of swallowing is rendered less painful (Wolfenden).

All mechanical, chemical, or thermal irritants must, of course, be avoided ; the food must not be too hot or too cold, and must be entirely free from condiments and acids. Even salt had better be left out in the cooking, the patient adding it afterwards in such quantities as do not cause irritation.

Recently amputation of the epiglottis has been recommended by Lake and others. When the pain is evidently due to the passage of food over its surface, the procedure is attended with considerable success. In many instances the patients have subsequently improved in general health and increased in weight owing to being able to take ample nourishment without suffering. Except, perhaps, in very advanced cases, it does not seem to be followed by any local or pulmonary extension of the disease. It is carried out by means of Barwell's forceps, as above described. A local anaesthetic is, of course, necessary.

For the relief of *pain*, whether occurring in connection with deglutition or independently of it, an insufflation of orthoform is quite the best application, and being practically innocuous it may be applied freely. It not only acts quickly but its effects last a very long time, often as long as twenty-four hours, so that by a daily application the patient may be kept comfortable. If the larynx is full of secretion it should be previously cleansed by a spray of alkaline lotion (p. 31). If the discharge is purulent, or if ulcers look very unhealthy, an equal part of iodoform may be mixed with the orthoform with advantage, in which case each ulcer should be carefully covered with the powder with the help of a laryngeal mirror. The following useful formula is recommended by Freundenkiel for use either as a paint or spray :—

R.	Menthol	.	.	.	.	.	1·0 part to 15·0 parts.
	Oil of sweet almonds	.	.	.	.	.	30·0 "
	White of egg	.	.	.	.	.	25·0 "
	Orthoform	.	.	.	.	.	12·0 "
	Water to	.	.	.	.	.	100 "

If the patient is so situated that he cannot attend the surgeon daily, he must use the orthoform insufflation for himself by means of Leduc's glass tube (p. 55).

Many other applications are also useful, and though none of

them are quite so generally satisfactory as orthoform powder, yet in individual cases they may be employed with advantage. The following are among the best :—

Morphia $\frac{1}{8}$ to $\frac{1}{4}$ gr. with 2 grs. of starch, used as an insufflation.

Cocaine or eucaine 5 per cent. solution, used as a spray ten minutes before food.

Menthol 20 to 30 grs. to 1 oz. of paroleine, used as a spray or paint.

Supra-renal extract 5 per cent. solution, used as a spray.

Pastils of cocaine or orthoform.

Submucous injections of morphia or cocaine into the posterior wall of the larynx have been strongly recommended, but the process entails considerable discomfort to the patient. Ordinary hypodermic injections of morphia, however, may be necessary and beneficial in bad cases. Sometimes nothing seems to give much relief to the pain, and the patient remains unable to swallow and seems to be rapidly going downhill for want of nourishment. Tube feeding may then be adopted if it seems worth while, but it must be done in such a way as to cause as little distress as possible. The cause of the dysphagia being confined to the larynx, it is sufficient to pass the tube but an inch or so into the oesophagus, thus diminishing the discomfort. The tube should be quite soft and not bigger than a No. 14 catheter, and if possible it should be passed to one side or the other of the epiglottis. As a last resource rectal feeding may have to be ordered.

The *Cough* often requires to be moderated, as it is most deleterious both locally and generally. In very early stages the applications of tincture of perchloride of iron (60 gr. to 1 oz.) as a paint or spray proves useful by rendering the mucous membrane less irritable. In later stages the application of orthoform, or $\frac{1}{8}$ gr. of morphia diluted with starch, are the most efficacious local sedatives. Before making the application the larynx should be thoroughly cleansed from all secretions by means of an alkaline spray. This not only tends in itself to check the cough, but enables the powder to reach the irritable mucous membrane or ulcerated surface and so produce its full effect. Menthol, used as a spray or given in lozenges or pastils, is here again one of the most useful drugs. The following spray may also be tried :—

R.	Bromide of potassium	20 gr. = 1.37 gm.
	Hydrochloride of cocaine	$\frac{1}{2}$ gr. = 0.032 gm.
	Water	to 1 oz. = 30 c.c.

Combined with these local applications sedative cough mixtures must be given. The following are useful formulæ :—

Linctus Morphinæ.

R.	Acetate of morphia	$\frac{1}{4}$ gr. = 0.016 gm.
	Glycerin	1 dr. = 3.75 c.c.
	Mucilage of gum acacia	1 oz. = 30 c.c.
To be sipped slowly before meals.		

Linctus Camphoræ Compositus.

Compound tincture of camphor	}	of each one ounce.
Oxymel of squills		
Syrup of tolu		
Glycerin		

Dose : one teaspoonful (3.75 c.c.) every four hours.

Linctus Morphinæ Compositus.

R.	Solution of acetate of morphia	40 m. or 2.5 c.c.
	Dilute hydrocyanic acid	30 m. or 1.87 c.c.
	Oxymel of squills	2 dr. or 7.5 c.c.
	Syrup of lemons	2 dr. or 7.5 c.c.
	Water	ad. 1 oz. or 30 c.c.

Dose : 1 dr. (3.75 c.c.) every four hours.

Codeine or morphia lozenges are also often beneficial and may be allowed in bad cases. Heroin in doses of $\frac{1}{20}$ gr. given every four hours will often keep the cough under control when every other means have failed, and should be given a trial. Finally it must be remembered that the patient can himself do a very great deal to check the cough by an effort of will, and he must constantly be reminded of this by the friends or nurse in charge. While continued coughing should be checked by one or more of these methods, it must not be altogether abolished, otherwise the lungs may become blocked with purulent and septic material, with mischievous results. It is a good plan to make the patient cleanse the bronchial tubes and trachea by coughing at stated intervals, and a very good time to set apart for this purpose is immediately before each meal, so that his own and other people's feelings may not be upset by coughing and expectoration during the meal.

Dyspnæa.—Marked laryngeal stenosis is fortunately very rare in tubercular laryngitis. The condition of the lungs induces great breathlessness, which may be increased by the swollen state of the larynx. Keeping the larynx free from secretions and the palliative treatment already suggested will do much to relieve

this discomfort. Incisions, scarifications, and the removal of granulations have been recommended, but in advanced cases they are not to be advised, as they cause great distress and their results are not permanent. If the dyspnoea should be such as to endanger life, tracheotomy is the best treatment. Intubation has been recommended, but a foreign body on an ulcerated surface is hardly desirable. The tube, moreover, often causes pain and increased swelling, and adds to the difficulty of swallowing.

B. Pharyngeal Complications of Phthisis

Tuberculous complications of phthisis are far less common in the pharynx than in the larynx, but when they occur must be looked upon as of very grave import.

Pathological Changes.—Three varieties may be recognised : (1) Acute miliary tuberculosis ; (2) Discrete tuberculous ulceration ; and (3) Tuberculous infiltrations. Affections resembling the latter may possibly occur apart from phthisis.

1. **The Miliary form** is usually met with in acute tuberculosis, and runs a very rapid course. It is characterised by the deposit of numerous miliary tubercles in the mucous membrane of the faucial arches, the soft palate, the uvula, and less frequently in the tonsils and posterior wall of the pharynx. The tubercles rapidly break down, coalesce, and lead to extensive patches of ulceration. Each patch is irregular in shape with undermined edges, and is surrounded by an inflammatory areola on an otherwise anaemic mucous membrane. There is generally considerable oedema, especially of the soft palate and uvula, and the cervical glands rapidly become enlarged and painful.

2. **Discrete Tuberculous Ulcers** are very rare, and generally occur singly. They are most commonly met with on the pharyngeal arches, the tonsils, and the posterior wall. They are about the size and shape of a split bean, their edges are often slightly raised and undermined, and their surfaces are covered with dirty grey necrotic débris, underneath which are small pale granulations. The surrounding mucous membrane is nearly always intensely pale and of a bluish-grey colour. Occasionally the formation of granulation tissue is in excess of the ulceration, in which case large granulomatous masses are found springing from the base of a small tuberculous ulcer, which they may completely hide. This occurs in the less acute cases. Discrete tuberculous ulcers

are generally accompanied by early and marked enlargement of the glands.

3. Tuberculous Infiltrations.—This is a more chronic form of pharyngeal tuberculosis, and may possibly occur as a primary lesion. Clinically it is more allied to lupus than to tuberculosis. The infiltration usually occurs "along the posterior pillars of the fauces, and resembles an aggregation of large, bluish-red lymphoid granules, but they are tender and hard to the touch. When they disintegrate the ulceration is indolent, and granulations and nodular thickening may cause it to resemble lupus. The cervical glands may soon become enlarged and tender" (Watson Williams).

Symptoms and Course.—Miliary tuberculosis is a very acute disease, and the patient is evidently acutely ill. The temperature is raised, rapid wasting occurs, and death is not long postponed. The discrete ulcer may occur early or late in the course of pulmonary tuberculosis, but always means infection of a severe type. The more general symptoms become greatly aggravated when the pharynx becomes involved, and the patient generally goes rapidly downhill. Tuberculous infiltration, as already stated, is a more chronic infection and behaves clinically more like lupus. In the first two varieties the chief local symptoms are most severe pain and dysphagia, often out of all proportion to the objective appearances. The pharynx, moreover, quickly becomes filled with viscid mucus, which the patient is afraid to swallow and is often unable to expectorate, and which consequently adds greatly to his distress.

Diagnosis.—The general condition of the patient and the local changes are generally sufficiently definite to establish a diagnosis. Occasionally diphtheria, herpes, and the various lesions of syphilis may have to be excluded.

Treatment.—**1. Of Miliary Tuberculosis.**—In this condition the general treatment is more important than local measures. The patient must be kept at absolute rest in bed in the best hygienic surroundings possible, and the general medicinal and dietetic treatment recommended as suitable for cases of laryngeal tuberculosis (p. 106) must be followed out.

As regards local treatment, the patient's general condition is as a rule too bad, and the local process too acute, to allow of any hope from surgical or other energetic methods of treatment. The objects, therefore, to be kept in view are to stay the activity of the disease by the use of cleansing and antiseptic applications,

to allay the pain, and relieve the dysphagia, which are generally very severe. The first indication is met by spraying the pharynx with an alkaline lotion (p. 31) in order to free the ulcers from sticky mucus, and by then insufflating iodoform. If there is much irritation the ulcers may be sprayed with a mild astringent such as sulphate of zinc (1 per cent. in water) or chloride of zinc (1 per cent. in water), before applying the iodoform. To allay the pain nothing is so useful as orthoform, which may conveniently be applied together with iodoform in equal parts. Its effects are sure and lasting, and it does not cause any poisonous results. It should be freely dusted on to the ulcerated surfaces. As alternatives the following may be tried: solution of cocaine (5 per cent.), morphia ($\frac{1}{8}$ gr. in 3 grs. of powdered starch), menthol (15 grs. to the ounce of paroleine), or the following insufflation is especially useful:—

R.	Iodoform	1 gr. = 0·07 gm.
	Boric acid	1 gr. = 0·07 gm.
	Hydrochloride of morphine	$\frac{1}{8}$ gr. = 0·008 gm.
	Hydrochloride of cocaine	$\frac{1}{6}$ gr. = 0·011 gm.
	Powdered starch	to 4 gr. = 0·27 gm.

These applications, especially orthoform, are also useful for the relief of dysphagia, but in the treatment of this symptom the administration of a suitable diet is most important. In ulceration of the pharynx, as in ulceration of the larynx, it is found that semi-solids are better tolerated than either solids or liquids; directions as to diet and methods of feeding have already been given (p. 124).

2. **Discrete Tuberculous Ulcers.**—The general and symptomatic treatment of these cases is usually the same as for the miliary form; but when the patient's general condition is fairly good, it may occasionally be right to attempt a more radical line of treatment in the hope of obtaining cicatrisation of the ulcer. The ulcers should be swabbed with a 20 per cent. solution of cocaine, and thoroughly scraped with a sharp spoon, and finally their bases well rubbed with pure lactic acid. This may require to be repeated. Between each sitting the patient must twice daily use an alkaline wash followed by iodoform insufflations. If the ulcer is covered by exuberant granulations, these should be first removed with a snare and then the ulcer treated as above. If this treatment is efficiently carried out, a good result, as far as the local condition is concerned, will follow in a certain number

of cases, but ultimately the patient will probably succumb to phthisis.

3. Tuberculous Infiltrations.—These cases being much more chronic in nature, combined general and local treatment hold out greater prospects of relief. The general treatment already recommended for laryngeal tuberculosis should be carefully carried out (p. 106), and locally the treatment recommended for lupus of the pharynx (p. 137) is applicable.

C. Nasal Complications of Phthisis

Tuberculosis in the nose is far rarer than in any other part of the upper respiratory tract, and tends to run a more chronic course than in either the pharynx or larynx.

Pathological Changes.—Two forms are met with: (1) Tuberculous ulceration, and (2) Tuberculomata.

The *ulceration* is generally seen on the anterior part of the septum, or on the floor of the nose. If on the septum it is usually situated in the mucous membrane covering the anterior triangular cartilage about half an inch within the nostril. The ulcer is at first, and for a long time, superficial, but later it tends to deepen and may eventually cause a perforation of the cartilaginous septum. Tuberculous ulcers are of a greyish colour, their outline is irregular, and there is but little injection or discoloration of the surrounding mucous membrane.

Tuberculomata spring with about equal frequency from the septum and the inferior turbinate, and more rarely from the middle turbinate. They may be the only sign of tuberculous disease, or there may be evidences of past or present ulceration. When occurring on the inferior turbinate they have the appearance of an ordinary hyperplastic outgrowth, for which they may be easily mistaken. They vary in size from that of a pea to that of a bantam's egg; they are of a reddish-grey colour, and have an uneven mammillated contour. Tuberculomata remain stationary for very long periods, but eventually they caseate and break down, when all the characteristics of an ordinary tuberculous ulcer may be observed. Clinically and pathologically it is often difficult to draw any sharp line of distinction between cases secondary to phthisis and lupus. Some authorities go so far as to maintain that all tuberculous affections of the nasal cavities are lupoid in nature (Escat).

The **Symptoms** of tuberculous ulceration are slight pain and discharge. The latter is of a greyish colour, often blood-stained and occasionally somewhat offensive. The symptoms of tuberculomata are those of nasal obstruction, which may vary from mere stuffiness to complete stenosis.

The **Diagnosis** is always a matter of some difficulty. The ulcerative form must be distinguished from simple and syphilitic ulcerations, and a tuberculoma from simple hyperplasia and malignant growths. In doubtful cases microscopical evidence is most valuable.

The **Prognosis** of nasal tuberculosis is not very satisfactory as regards accomplishing a complete cure, but as before stated the disease tends towards a chronic course and much may be done by treatment to keep it in abeyance and to render the patient comfortable.

Treatment.—**General Treatment** is of the utmost importance, and must be conducted on the same lines as that suggested for tuberculosis of the larynx (p. 106).

Local Treatment.—Broadly speaking the local treatment is the same as for lupus of the nose (p. 136), modified in some instances by the fact that the local lesion is but part of a general infection. In such cases the patient's general condition may not allow of active measures, and milder treatment must be adopted. The nose should be kept clean by an alkaline or mildly antiseptic lotion, such as Collunarium Alkalimum or Collunarium Sanitas (p. 29), and the ulcers dusted with iodoform, or the following paint may be applied by means of wool twisted on a carrier:—

R.	Iodoform	8 gr. = 0.55 gm.
	Menthol	4 gr. = 0.27 gm.
	Lanoline	½ oz. = 15 gm.
	Liquid vaseline	½ oz. = 15 c.c.

Should, however, the general condition be favourable, an attempt may be made to remove the disease and induce cicatrisation. Large tuberculomata should be removed with a snare, their bases scraped, and lactic acid applied, whilst ulcers should be thoroughly curetted and cauterised; in fact, the treatment is on precisely similar lines to those for lupus of the nasal cavities. The results are, of course, more uncertain, as healing is slow, and there is considerable danger of re-infection of the wound; whilst if healing does take place the cicatrices are extremely liable to break down afresh.

II. LOCAL TUBERCULOUS LESIONS

A. LUPUS OF THE NOSE, PHARYNX, AND LARYNX

Lupus of the upper air passages may occur as a primary infection or it may be secondary to lupus of the face. The nose is perhaps most often, and the larynx least often, attacked, and the disease usually spreads from above downwards. The larynx or pharynx may, however, be attacked alone, or the nose and larynx may be affected whilst the pharynx remains healthy. The disease is more common in females than in males and, although it usually commences at about puberty, it is by no means limited to this period of life, being met with both in childhood and in old age. It is essentially a chronic disease, and there is in the mucous membranes, as in the skin, a general absence of inflammation, with a tendency for healing and for extension of the ulceration to go on simultaneously in different parts of the area affected. As the disease progresses the lupoid nodules coalesce, forming extensive raised patches with an uneven surface and with superficial ulceration in places. More rarely, deep and destructive ulceration may be seen.

Lupus of the Nose.—This generally commences just within the nostrils, the anterior part of the septum being first attacked, and thence the disease may spread to the floor of the nose and to the turbinate bodies, whilst later, it tends to involve the throat, and also the skin if not previously affected. The tuberculous granulations are usually somewhat exuberant, pale, and accompanied by but little secretion. Later, ulceration occurs and slowly spreads, often eventually destroying the anterior part of the septum and sometimes involving the alæ, the columella, and even the bony septum.

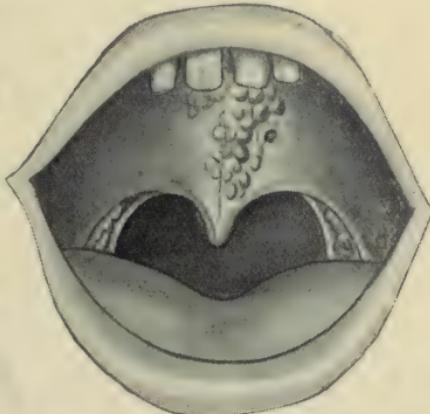


FIG. 79.—Early lupus of the soft palate.

Lupus of the Pharynx.—The uvula, the free edges and buccal surface of the soft palate, and the anterior pillars of the fauces are the most usual seats of the disease (Fig. 79). These parts become thickened and nodular and later small superficial ulcerations

appear, which extend slowly both on the surface and deeply, healing in one place but spreading in another. Later still, cicatricial tissue develops which often causes great deformity and distortion, and which shows a marked tendency to break down afresh. Though the morbid process is as a rule sluggish, occasionally great destruction of the palate may occur with considerable rapidity. The disease commonly spreads on to the hard palate and to the alveolar margins. The posterior pharyngeal wall is also often affected, with or without disease of the palate.

Lupus of the Larynx.—The epiglottis is usually first attacked, and the disease then tends to spread downwards, the vocal cords being the last structures to be invaded. The affection is characterised by considerable infiltration and tumefaction (Figs. 80 and 81), and later, as cicatrisation takes place, considerable deformity may occur, which, either alone or together with the swelling



FIG. 80.—Lupus. Thickening and ulceration of the epiglottis.



FIG. 81.—Lupus. Nodular infiltration and thickening of epiglottis.

due to the disease, may give rise to laryngeal stenosis. The ulceration is always very slight and slow, and, except in the case of the epiglottis, which may be completely destroyed, it rarely extends beneath the mucous membrane.

Symptoms.—The symptoms as a rule are unimportant, often being hardly sufficient to direct attention to the parts affected. When the larynx is involved, dyspnoea may develop, but it is rarely acute, and there is generally ample time to arrange for tracheotomy. When the pharynx is involved, contractions, adhesions, or perforation of the palate may cause alteration of the voice, dysphagia, and regurgitation of liquids through the nose.

Prognosis.—The disease, although slow, is essentially progressive and leads in the end to extensive destruction and deformity, but in the majority of cases it yields to treatment or becomes arrested after a time. In a few instances phthisis ultimately supervenes, especially when the larynx is affected. Apart from this the chief dangers lie in the possible necessity for

tracheotomy, and the complications which may arise through wearing a tube.

Diagnosis.—Lupus has to be distinguished from syphilis, especially in its inherited form (p. 165). This is sometimes very difficult, and cases are constantly seen in which the patient has been submitted to repeated operations under the idea that the disease was lupus, and yet healing has immediately occurred when the patient has been subjected to anti-syphilitic remedies (p. 168). In doubtful cases such remedies should therefore always be tried, and if any doubt still remain a portion of the diseased tissues should be excised and submitted to microscopical examination. Occasionally malignant disease will have to be excluded.

General Treatment.—This is always extremely important, and in disease limited to the pharynx and larynx medicinal treatment alone may be sufficient to effect a cure. Arsenic seems to act directly on the disease, and in many cases to have almost a specific action in controlling it. Three minims of the Liquor Arsenicalis should be given three times a day after food, and the dose gradually increased up to ten or fifteen minims or even more. Should it cause dyspepsia or gastric pain, it must be discontinued for a time and then cautiously re-commenced, being omitted on one day each week. Given in this way tolerance will soon be established, and large doses can be taken for a considerable time without producing any ill effect. When the pharynx only is involved, the disease often heals in the course of three or four weeks under this treatment alone. In the larynx the results are good, but not so rapid, whilst in the nose it must always be combined with local measures. When the disease has apparently been arrested the drug should be continued intermittently for a further six to eight months.

As already mentioned (p. 111), Koch's tuberculin (T.R.) is now somewhat extensively used for lupus of the skin, and with good results. For lupus of the nose and pharynx there is no reason why it should not be used, its administration being guided by careful observation of the opsonic index. For lupus of the larynx it must be used more guardedly ; and if there is much infiltration causing narrowing of the passage, it would be advisable to do a preliminary tracheotomy in case of excessive reaction.

It is most important to attend to the patient's general health, which often greatly deteriorates. Tonics, such as iodide of iron and cod-liver oil, together with a liberal and well-regulated diet, must be

advised, and a prolonged visit to the seaside, or a course of treatment at an open-air sanatorium is advisable.

Local Treatment.—In *Lupus of the Nose* local treatment will usually be required in addition to the general treatment above detailed. The best plan is to scrape away the disease thoroughly, and subsequently to apply a caustic agent. A general anæsthetic is as a rule advisable, but in slight cases the operation may be done under cocaine. If a general anæsthetic be given, the post-nasal space should be plugged with a sponge attached to a tape in order to avoid difficulties caused by the entry of blood into the throat, as the hæmorrhage is sometimes very severe. All the diseased parts are then thoroughly scraped with a sharp ring knife (Fig. 121, p. 242) under good illumination, every care being taken to remove the whole of the diseased tissue. The hæmorrhage must be arrested, and the galvano-cautery, pure chromic acid, or nitric acid applied to the whole of the raw surface. If chromic or nitric acid is used the excess of acid must be neutralised by a solution of bi-carbonate of soda. If the hæmorrhage is very free cauterisation must be postponed, and carried out a few days later under a local anæsthetic.

In slight cases the after-treatment consists in keeping the nose clean by the frequent use of lotions, such as the Collunarium Alkalimum, Collunarium Sanitas, or Collunarium Potassii Perman-ganatis (pp. 29, 47). After cleansing, the nose should be well sprayed with a solution of menthol in paroleine (5 grs. to the oz.), which is soothing and prevents the formation of crusts. In the more severe cases it is better to keep the nose lightly packed for a week or ten days with strips of gauze soaked in iodoform and glycerin emulsion. The gauze should be removed daily and the nasal cavities cleansed with alkaline lotion. If there is much pain the surface of the wound may be dusted over with equal parts of iodoform and orthoform. If the healing process is very sluggish, the occasional application of 50 per cent. or 60 per cent. solution of lactic acid may be tried.

By these means the disease may sometimes be eradicated, but as a rule, though complete healing has apparently taken place, a relapse occurs. The case should therefore be kept under observation for a considerable time, and every fresh outbreak promptly treated.

The above treatment is most likely to give the best results, but when the disease is strictly limited the simple application of

caustics, such as chromic or lactic acid, or chloride of zinc paste may promote healing. Resorcin (98 grs. to the oz. of glycerin of borax), sodium formate (2 per cent. to 10 per cent.), guaiacol (20 per cent.), and pyoktanin (20 to 40 grs. to 1 oz. of stearate of zinc) have also been recommended as local applications.

In Lupus of the Pharynx.—Local treatment is rarely required, but in obstinate cases healing may be hastened by the application of caustics with or without curettement according to the extent of the disease. Pure lactic acid may be applied to sluggish ulcers once or twice a week under cocaine anaesthesia, or, if there is much infiltration, chromic acid or nitrate of silver fused on a probe. Iodin (one part in five of spirit) is also useful in promoting healing. If there are large lupoid nodules without much ulceration the galvano-cautery should be used, two or three nodules being destroyed at each sitting. If the disease is limited to the uvula, to one of the anterior pillars of the fauces, or to a small portion of the soft palate, the affected area may advantageously be excised. By these methods the disease can usually be arrested, but recurrence is very usual.

In the rarer cases in which there is extensive ulceration and infiltration and in which considerable destruction has occurred, it is advisable to curette the diseased tissues, and for this purpose a general anaesthetic is necessary. The bases of the ulcers and any lupous nodules are, as far as possible, scraped away with a sharp spoon or ring knife, and, the haemorrhage having been arrested, pure chromic or lactic acid is applied. The after-treatment consists in keeping the parts clean with mild antiseptic solutions, such as the Nebula Alkalina or Nebula Potassii Permanganatis (pp. 28, 50) used in the form of a spray. To promote healing, lactic acid in a 60 per cent. solution may be brushed over the wound at intervals of about a week. If much pain is caused, equal parts of iodoform and orthoform may be applied.

In Lupus of the Larynx.—The general treatment, and especially the administration of arsenic, must be continued for a long time, but in a few cases local treatment may be advantageously combined with it. When the disease is so situated as to render it possible, the affected area may be excised. This is usually only possible when the epiglottis is alone attacked, but in some cases large excrescences springing from the ventricular bands, or even from the vocal cords, may be removed. Although the whole of the disease is not taken away, the ultimate cure is hastened.

Cocaine anaesthesia must be induced (p. 65), and then as much as possible of the diseased tissue, which is usually very tough, is cut away with Krause's or Lake's forceps (Figs. 75 and 76), and chromic acid fused on a probe is firmly applied to the wound (p. 36). Some surgeons prefer the galvano-cautery, destroying two or three lupus nodules at a time. Great caution is, however, necessary for fear of inflammatory reaction and dangerous oedema.

When the disease is widely distributed or is so situated as to be unsuitable for these methods, scraping with Heryng's curette may be practised. The resulting raw surface should be dried and chromic acid well rubbed in. It will be necessary to repeat this operation on several occasions. When healing commences lactic acid should be applied twice or three times a week.

Laryngeal stenosis may occur when the cords or subglottic regions are involved and extensively infiltrated, or when great cicatricial contraction takes place during healing. It sometimes calls for tracheotomy to prevent asphyxia, and the operation should not be delayed too long when once it is evident that it will become necessary. It is extremely probable that the tube will be permanently required. Intubation may be advantageously substituted for tracheotomy in some cases, as the pressure of the tube may promote absorption of the inflammatory infiltration. The methods of performing tracheotomy and intubation are described in Chapter iii.

If a stricture should follow the cessation of active disease, attempts may be made to dilate it as in other cases of laryngeal stenosis, but the success of these measures is extremely doubtful (p. 164).

B. CHRONIC RETRO-PHARYNGEAL ABSCESS

Etiology.—Chronic tuberculous retro-pharyngeal abscess is most often met with in children. It may be due to infection, caseation, and suppuration of the retro-pharyngeal glands, or it may be secondary to tuberculous caries of the cervical vertebræ. The retro-pharyngeal glands are four in number, two on each side of the second and third cervical vertebræ. They may become infected from any of the causes that lead to tuberculous infection of the cervical glands, with which this affection is not uncommonly associated. Infection, for instance, may be a result of chronic rhinitis or diseases of the pharyngeal or faucial tonsils.

Pathological Changes.—The disease is characterised by a red, smooth, rounded, fluctuating swelling of the posterior pharyngeal wall, usually to one side of the median line. Occasionally there is some swelling of the corresponding side of the neck.

Symptoms.—If the abscess be large there will be great dysphagia, whilst dyspnoea may threaten life and even prove fatal, if the disease be situated low down. There is usually a constant cough, and the voice somewhat resembles that accompanying quinsy.

The **Diagnosis**, which is usually easy, must be made by inspection and by palpation with the finger. A softening gumma, sarcoma, diphtheria, or quinsy may give rise to conditions resembling retro-pharyngeal abscess.

Prognosis.—With appropriate treatment the prognosis is good, except in the cases connected with spinal caries. If, however, the abscess becomes very large, it may cause serious dyspnoea, or, if it be allowed to burst spontaneously, death may possibly result from suffocation. There are also dangers arising from septic infection should the abscess burst or be opened into the pharynx.

Treatment.—The main indication for treatment is to evacuate the pus as quickly as possible. There are two methods of effecting this: (1) External and (2) Internal Operation. The former method, although a little more difficult to carry out, is by far the better, because the whole treatment can be effected with anti-septic precautions, and complete evacuation of the pus can be insured. It is therefore indicated in nearly all cases, except when the abscess causes dyspnoea in infants under three years of age. The internal operation is easily performed, but it is often impossible to evacuate the pus entirely; there is danger of pus entering the windpipe during the operation, and there is great risk of septic infection of the abscess cavity after the operation.

The **External Operation** is thus performed: When there is no swelling in the neck and when there are no enlarged glands which require removal, the abscess should be opened through an incision behind the sterno-mastoid muscle on the side to which the abscess inclines. The skin having been shaved and thoroughly purified and a general anaesthetic administered, an incision two or three inches in length is made along the posterior border of the sterno-mastoid muscle on a level with the abscess. The incision is deepened until the deep cervical fascia has been freely divided and the posterior edge of the muscle defined. With the fingers, aided by a blunt dissector, the sterno-mastoid muscle is then

raised, and hooked forward by means of a retractor. Working carefully inwards, chiefly by means of the finger, the large vessels and nerves in the carotid sheath are separated from the front of the cervical vertebræ and are carefully pushed forwards. The transverse processes of the vertebræ and subsequently their bodies must be defined, and the dissection slowly deepened in front of them. A pair of dressing forceps is guided along the anterior surface of the vertebral column, and thrust through the abscess wall, making a hole which is enlarged by opening the forceps as they are withdrawn. The finger is then introduced and the abscess cavity explored. If there is much caseating material the cavity may be gently scraped out, great care being taken not to make communication with the pharynx. Subsequently the *débris*, pus and broken-down tissue should be flushed out by irrigation with a mild antiseptic, such as perchloride of mercury (1 in 10,000) or boric lotion. A large drainage tube is inserted and stitched to the edges of the incision, the rest of the wound is sutured, and the usual antiseptic dressings applied. The discharge for the first few days is usually very free, but when it ceases the tube may be gradually shortened, and can generally be safely dispensed with in from ten to fourteen days.

The results of this operation are extremely satisfactory. There is no danger of wounding any of the large vessels, if care be taken to use only blunt instruments and to work inwards close to and in front of the vertebræ. The chief danger arises from the necessity for giving a general anæsthetic, especially if dyspnoea be present; instruments for performing tracheotomy, therefore, should always be at hand, and in some cases a preliminary tracheotomy may be advisable. In the great majority of cases, however, even where a large abscess is present, the operation may be performed safely, and immediately the pus is evacuated respiration becomes unimpeded. In these cases, of course, as little anæsthetic as possible should be given.

When the abscess is obviously pointing in the anterior triangle, or a large mass of tuberculous glands is present, the operation should be varied accordingly. It is then best to make a free incision along the anterior border of the sterno-mastoid and to remove all the affected glands by dissection in the usual way. When this has been done the abscess will come into view, and should then be freely opened, preferably behind the jugular vein. A counter-opening should be made behind the sterno-mastoid for

the insertion of the drainage tube, and after thoroughly irrigating the whole wound the anterior incision should as a rule be stitched up. The subsequent treatment is similar to that given above.

Internal Operation.—This consists in opening the abscess by means of an incision through the posterior pharyngeal wall of the pharynx and evacuating the pus into the mouth. In infants suffering from dyspncea this method is sometimes indicated. It may be rapidly and safely carried out by means of sinus forceps in the manner described for opening a peritonsillar abscess. A general anæsthetic should not be given, and the child should be held with the head downwards.

In older patients, if the operation be deemed advisable, an incision is made by means of a pharyngeal lancet or guarded bistoury, as near the middle line as possible, and low down so as to promote drainage. A general anæsthetic may be necessary, and, if so, the head should be kept low during the incision, and immediately afterwards the patient should be inverted so as to minimise the danger of flooding the larynx with pus. In order to lessen this danger it has been suggested that the opening should be made in the first instance at the upper part of the abscess cavity, or that the pus should be previously drawn off with an aspirator. This method of operation has nothing to recommend it except the ease with which it may be performed. Infection of the cavity will probably result, and the pus may burrow farther down in the neck, which will delay healing and may necessitate repeated operations.

In the cases secondary to vertebral caries the prognosis is much more grave, although the abscess cavity itself can usually be satisfactorily dealt with. In these cases, of course, the internal operation must on no account be attempted, as it will almost certainly give rise to septic infection with fatal results. Treatment must also be adopted for the disease of the spine, but this cannot be here discussed.

General Treatment.—The general health must be carefully attended to according to the indications of each particular case. Iodide of iron and cod-liver oil will be found especially useful.

C. CHRONIC TUBERCULOUS ABSCESS OF THE LARYNX

A chronic localised tuberculous abscess may in rare instances occur in or around one of the crico-arytenoid joints, quite apart from a more widely spread infection. This will be further alluded to under Chronic Perichondritis of the Larynx (Chap. xxiii.).

CHAPTER VI

COMPLICATIONS OCCURRING IN CHRONIC INFECTIVE DISEASES (*continued*)

I. **SYPHILIS**: A. *Primary*.—Treatment.—B. *Secondary*.—Erythema—Mucous Patches—Superficial Ulceration—General and Local Treatment.—C. *Tertiary*.—Gummata—Deep Ulcerations—Deformities.—D. *Hereditary Syphilis*. II. **LEPROSY**. III. **GLANDERS**. IV. **RHINOSCLEROMA**.

I. SYPHILIS

THE upper respiratory passages are very frequently involved in the course of syphilis. The primary sore is rare, but secondary and tertiary lesions are common, and are most usually met with between the ages of twenty and thirty-five, though no age is exempt.

Acute and chronic catarrhal inflammation seems possibly to be a determining factor in the occurrence of tertiary syphilitic manifestations in the upper air passages, which may account for their being more common in men than in women.

A. PRIMARY SYPHILIS

Of the Nose.—Infection is generally caused by picking the nostril with an infected finger. It is characterised by the occurrence of an indurated swelling with some ulceration of its surface. It is generally situated on one of the alæ, or just within the vestibule, though it is sometimes seen on the true mucous membrane. It is accompanied by considerable swelling, œdema of the whole nose, and by early and marked enlargement of the sub-maxillary glands of the same side. It causes obstruction of the affected nostril, bleeds easily, and gives rise to discomfort, but no real pain. When the chancre occurs on the true mucous membrane, it may be mistaken for sarcoma.

Of the Pharynx.—The poison is first conveyed to the lips or tongue through kissing, or through the use of infected glasses, cups, forks, spoons, tooth-brushes, pipes, &c. It is then carried to the pharynx by the secretions in the act of swallowing. It

has unfortunately been occasionally caused by the use of improperly cleaned instruments, such as tonsillotomes. The sore is generally located on one of the tonsils, the crypts of which lend themselves to the retention and development of the poison, but it may occasionally be seen on the palate or palatal arches.

The chief *Symptoms* are an aggravated and prolonged sore throat and painful deglutition, always referred to the affected side. It may be ushered in by marked febrile symptoms. On examination an indurated swelling with a sluggish ulcer in its centre may be seen. The latter is of a greyish colour, has a granular appearance, and is covered with inspissated mucus. There is early and unilateral enlargement of the glands at the angle of the jaw, usually painless, though sometimes tender on pressure.

The *Diagnosis* should exclude epithelioma and ulcerating gumma. The appearance of a secondary rash or of mucous patches in the mouth or pharynx will help to determine the diagnosis in favour of a primary chancre. In doubtful cases epithelioma must be excluded by removal of a portion of the diseased tissue for microscopical examination, and tertiary syphilis by the results of treatment with iodide of potassium and mercury.

Of the Larynx.—Primary sores in this situation are so rare that their etiological factors, pathological appearances, and symptoms cannot be classified. Such cases as have been reported were apparently not diagnosed until the development of secondary symptoms. Moure reports a case which occurred on the free border of the epiglottis, and Poyst reports that he has seen one on the left ventricular band.

Treatment.—In the treatment of primary syphilis general measures are of more importance than local applications. Directly the diagnosis is established, mercury must be administered. It may be given in the form of pills, mixture, inunctions, or injections. Locally, the affected part must be kept thoroughly clean and free from inspissated mucus by the frequent use of the Nebula Alkalina (p. 31), and the sore should be covered with iodoform or dermatol powder by means of a suitable insufflator two or three times a day.

B. SECONDARY SYPHILIS

Pathological Changes.—In secondary syphilis three forms of lesions occur, namely, a general erythema, mucous patches, and superficial ulceration.

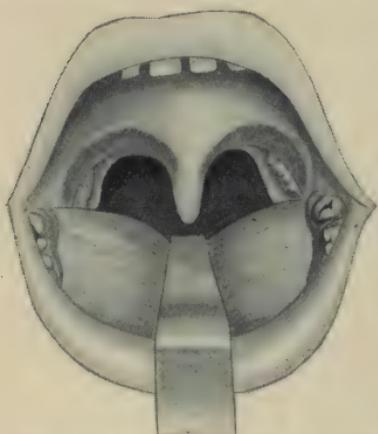
Erythema.—This is by far the commonest of the secondary affections, and commences about the time of the appearance of the rash. The chief changes are hyperæmia and slight thickening of the mucous membrane. It has little to distinguish it from an ordinary catarrhal inflammation, except that the mucous membrane is of darker colour, being often of an almost purple hue; there is a tendency to dryness, and the affection is more persistent. In the *nose* these changes are seen chiefly over the

inferior turbinals, and are accompanied by a scanty and sometimes brownish discharge. In the *pharynx* the soft palate and tonsils are chiefly affected. There is a sharp line of demarcation between the affected and healthy parts, and the redness does not extend forward to the hard palate. Often two sharply defined crescentic patches of dusky redness are seen situated on the anterior pillars and spreading over the velum. They are quite symmetrical and nearly meet in the middle line above the uvula (Fig. 82). This condition may be

FIG. 82.—Crescentic patches of dusky redness on the anterior palatine arches and soft palate from a case of secondary syphilis.

looked upon as almost pathognomonic of secondary syphilis, and should lead to a most careful inquiry into the history of the case and to an investigation for other signs of the disease. Accompanying these crescentic patches of dusky redness, slight opalescence of the mucous membrane of the tonsils or other parts of the fauces may be seen. This is often very slight, being confined to the edges of the anterior or posterior pillars, or to the anterior borders of the tonsils, but when seen together with the dusky redness, it is a sure characteristic of syphilis. The tonsils often become considerably enlarged, and the mucous membrane covering them has the same dusky red appearance. In the *larynx*, erythema is very common in early secondary syphilis, and is fairly widely distributed. Occasionally the cords have a mottled red and white appearance which is highly suggestive of this affection.

Mucous Patches.—These are practically unknown in the nose, and far from common in the larynx, but often occur in the pharynx. They are most frequently met with soon after the



appearance of the rash, though they may precede it or appear quite late in the course of the disease. In the pharynx they occur on the tonsils, uvula, soft palate, or palatine arches, and occasionally on the posterior wall. They are round or oval and slightly raised above the surface of the mucous membrane, and they vary in size from a split pea to a bean, though two or three may coalesce and cover a large area. They are covered with a bluish-white opal-coloured membrane (hence the term "opaline patches"), and they are surrounded by an areola of inflamed mucous membrane. They are very persistent and show a great tendency to recur, fresh crops appearing even in the tertiary period. Occasionally the patches are much larger, more raised, dirty yellow in colour with an uneven cauliflower-like surface, resembling ordinary condylomata.

In the larynx mucous patches are sometimes seen on the epiglottis, vocal cords, or arytenoids; they usually appear as yellowish-grey patches, very slightly raised above the surface of the mucous membrane, and are much smaller than similar lesions in the pharynx. They are usually very evanescent, but occasionally they become eroded, and lead to the formation of quite superficial ulcerations. Should such an erosion occur on the vocal cords its edge becomes notched or saw-like. Very rarely the patches may be raised and distinctly yellow, resembling condylomata (Fig. 83).

Superficial Ulceration.—This is of rare occurrence, and should probably be considered an early tertiary, rather than a late secondary symptom, as it is due most likely to the breaking down of a superficial gummatous infiltration. It occurs from one to three years after infection, most usually in the pharynx, though the inferior turbinals, the epiglottis, arytenoids, and interarytenoid fold may be affected. In shape the ulcer is round or oval, its area is limited, its progress is sluggish, its surface is covered with a dirty yellow secretion, and the surrounding mucous membrane is injected.

Symptoms.—The symptoms accompanying erythema are not marked. There may be slight febrile disturbance at the very commencement of the trouble, followed by stuffiness of the nose, discomfort in swallowing, or hoarseness, according to the particular part affected. Mucous patches in the pharynx may cause more or less dysphagia. In bad cases this may be so distressing



FIG. 83.—Condyloma of epiglottis.

that the patient refuses food and becomes ill and wasted. If the larynx is affected there may be hoarseness or a persistent dry cough.

Diagnosis.—An early diagnosis is very important in all cases of secondary syphilis, for the sooner antisyphilitic treatment is commenced, the better are the patient's chances of ultimate and complete recovery. It must be decided by carefully observing the pathological changes and symptoms [already described, and by corroborative evidence in other regions of the body.

Prognosis.—With an early diagnosis and appropriate treatment the prognosis is good. If the vocal cords are the seat of either mucous patches or superficial ulceration, some slight permanent damage to the voice may result, especially to the singing voice.

TREATMENT

(A) **General Treatment** is more important than local, and differs in no way from the treatment of secondary syphilis elsewhere. Directly the case is diagnosed mercury should be given, if the patient is in fairly good general health. It may be conveniently given in the form of a pill containing two grains (0.129 gm.) of *Hydrargyrum cum Creta*. If this causes any intestinal pain or diarrhoea, two grains of the compound powder of ipecacuanha may be added. One pill should be given twice or three times a day after meals, and its effect carefully watched, and the dose modified if any signs of salivation or of tenderness of the teeth and gums occur.

The patient should be warned to take particular care and trouble to cleanse the teeth whilst taking mercury, and should paint the gums night and morning with an astringent such as the following :—

Glycerin of tannin	1 part.
Rectified spirit	3 parts.

If the patient is in an indifferent state of general health mercury is best administered in a tonic mixture such as the following :—

Solution of perchloride of mercury	1 dr. = 3.75 c.c.
Tincture of nux vomica	5 m. = 0.31 c.c.
Compound tincture of cinchona	30 m. = 1.87 c.c.
Chloroform water	to 1 oz. = 30 c.c.

Should the patient's general condition be seriously impaired it may be better to postpone the mercury for a time, and to prescribe

a liberal and nutritious diet, and a mixture of strychnine and perchloride of iron, combined if possible with complete rest and change of air.

If the patient is intolerant of mercury internally, inunction should be used, half a drachm of blue ointment being rubbed into the skin daily, a different part of the body being selected each day to avoid irritation of the skin. Absorption is greatly aided by hot baths (p. 156). As an alternative to inunctions intra-muscular injections of mercury may be used (pp. 156, 157).

In obstinate cases, or those in which the local symptoms occur late in the course of secondary syphilis, the addition of iodide of potassium to the mercurial treatment is generally efficacious. They may be conveniently combined in the following mixture:—

Biniodide of mercury	· · · ·	$\frac{1}{20}$ gr. = 0.003 gm.
Iodide of potassium	· · · ·	10 gr. = 0.69 gm.
Compound tincture of cinchona	· · · ·	30 m. = 1.87 gm.
Water	· · · ·	to 1 oz. = 30 c.c.

(B) **Local Treatment.**—Although secondary syphilis generally responds to general treatment alone, much may be done to hasten the cure by local treatment.

Erythema of the nasal cavities is best treated by keeping the mucous membrane clean and free from dried secretions by means of the alkaline wash (p. 29), to each ounce of which 5 gr. of chloride of sodium should be added. For the pharynx a spray or gargle of chlorate of potassium (12 gr. to the oz.) should at first be used, followed later by astringents such as chloride of zinc (10 gr. to the oz.).

If the larynx is affected the Vap. Tr. Benz. Co. (p. 52) will be found useful, followed in a week's time by astringent paints such as nitrate of silver (20 gr. to the oz.) or chloride of zinc (10 gr. to the oz.), if the redness persists.

Mucous Patches and Superficial Ulcerations require more active local measures, especially in the pharynx. They may be readily induced to heal by the application of an aqueous solution of chromic acid (30 gr. to the oz., or stronger if necessary), or of bicyanide of mercury (10 gr. to the oz.). Before the application it is very important that the surface of each mucous patch or ulcer should be carefully dried and freed from all secretions (p. 37), so as to enable the chemical agent to act directly on the diseased area. Two or three applications made in this way at two or three days' interval are generally sufficient to promote healing.

In the larynx no local treatment is, as a rule, necessary, but occasionally a mucous patch or superficial ulceration may prove very obstinate to general treatment and give the patient considerable distress, in which case the application of chromic acid fused on a laryngeal probe (p. 36) will be of great service.

It is very important to remember that the discharges of secondary syphilis are virulently infectious. Patients should be warned of this fact, and cautioned not to kiss others, and to reserve glasses, cups, forks, spoons, pipes, &c., for their own use. This great infectivity of the secretions must also be borne in mind in carrying out the local treatment, and even in making an examination. The surgeon's hands should be washed, all instruments boiled, and the cotton wool used for cleansing purposes burned.

C. TERTIARY SYPHILIS

In tertiary syphilis the local pathological changes are more serious than in the secondary form. All the stages of ordinary tertiary lesions may be met with in the upper respiratory tract, and they will be considered under the following headings : (1) Gummata ; (2) Ulcerations ; (3) Perichondritis and Necrosis ; (4) Resulting Scars and Deformities.

Gummata are not very frequently met with as such, for they have usually softened and discharged before the patient seeks advice. Though this is the general rule, it may happen that a gumma remains stationary for a very long period and shows little tendency to degenerate. Three varieties of gummata may be met with, viz. the circumscribed, the diffuse, and the nodular. Ulcerations are always due to the breaking down of pre-existing gummata, and may be superficial or deep ; the former being rare, and the latter common. Perichondritis and necrosis are common in the nose and by no means rare in the larynx. More or less scarring and deformity are necessary results after the healing of a tertiary ulcer.

Tertiary Syphilitic Changes in the Nose.—(1) Gummata.—Both circumscribed and diffuse gummata occur, but the diffuse are more frequent. The circumscribed gumma is seen as a large prominent rounded mass projecting from the septum, whilst in the diffuse variety the septum is irregularly thickened and swollen. In both forms the mucous membrane is smooth, unbroken, and injected, though in places it may be pale from being

stretched over the under-lying swelling. Both forms are hard or semi-elastic to the touch until they commence to break down. Gummatous infiltration of the turbinals also occurs, but is not usually recognised until ulceration has commenced.

(2) **Ulcerations.**—*Superficial Ulceration* is occasionally seen on the septum or inferior turbinate body. The ulcer is quite on the surface of the mucous membrane, slightly depressed in its centre, and covered with a stringy mucus. *Deep ulceration* is fairly common and is almost invariably accompanied by necrosis. The septum is by far the most common site of the tertiary ulcer, but the floor of the nose, the turbinals, and the nasal bones may also be involved. The typical deep, punched-out, crateriform ulcer is occasionally seen, but directly the bone is involved masses of granulations spring up and hide it. The discharge is at first purulent, blood-stained, full of shreds of necrotic tissue, and horribly foetid, but later it dries and forms large crusts, which are extruded with difficulty. As the disease progresses the septum is perforated, and later still extensive necrosis may occur leading to more or less destruction of any of the intra-nasal structures. The vomer is most frequently affected, and large portions of it separate and come away, but the cartilaginous septum, the nasal bones, the floor of the nose, the turbinate bodies, and the alar cartilages may all or any of them be involved. In the later stages of these destructive processes, large fibrous polypi, sometimes sessile and sometimes pedunculated, may develop.

Scars and Deformities.—As a result of tertiary syphilis both internal and external deformities may occur. Within the nose there may be adhesions, over-growths, abnormal cavities and recesses, or both nostrils may be converted into one huge cavity. Of the external deformities the following are amongst the more common:—(1) The saddle-back nose, the result of the destruction of the vomer and the nasal bones, in which the upper part of the bridge sinks into the face, leaving the point of the nose prominent and upturned (Fig. 99, p. 166). (2) Entire collapse of the anterior third of the nose, due to the destruction of the whole of the cartilaginous septum and perhaps part of the bony septum, accompanied by extensive cicatricial contraction. (3) The bull-dog nose, the result of the destruction of the vomer, nasal bones, and the septal cartilage, in which the whole nose sinks bodily into the face, leaving two slits for nostrils. (4) Complete

or partial destruction of cartilaginous alæ with subsequent contractions and adhesions leading to various deformities, and sometimes resulting in complete closure of one or both nostrils.

Tertiary Syphilitic Changes in the Pharynx.—(1) Gummata.

—All three varieties of gummata may occur in the pharynx. *Circumscribed Gummata* vary in size from a bean to a walnut, or even larger. They may be situated on the posterior wall of the pharynx, in the naso-pharynx, on either the oral or the pharyngeal surfaces of the velum, and occasionally on the tonsils. They are at first hard with somewhat ill-defined edges, but quickly soften and ulcerate.

Diffuse Gummata may occur either in the mucous membrane itself or in the sub-mucous tissues. In the former case there may be some slight redness and thickening, but the changes are not sufficiently marked to lead to recognition. The deeper infiltration causes an ill-defined irregular swelling of the part, in the centre of which some signs of softening can usually be observed. They occur in the posterior wall of the pharynx and soft palate with about equal frequency, and occasionally in the tonsils. When the gumma is on the upper surface of the soft palate, there may be little save redness to be seen from the mouth. A variety of diffuse gumma is met with in the lateral walls of the pharynx, causing large red painless swellings, generally bilateral and closely resembling ordinary hyperplasia, except that the swelling is more pronounced and less painful. These swellings are very persistent and do not show the usual tendency to soften and break down. Occasionally the infiltration is unilateral and of considerable size, in which case it may resemble a new growth or retro-pharyngeal abscess.

The Nodular Variety occurs chiefly on the soft palate and closely simulates lupus. The nodules are situated close together and are fairly widely distributed, and the palate looks rough, red, uneven, and thickened.

(2) Ulcerations.—Both superficial and deep ulcerations occur. When the original gummatus infiltration is in the mucous membrane proper, the result of its breaking down is a superficial serpiginous ulcer, characteristic of early tertiary syphilis. Such ulcers are seen on the tonsils, soft palate, and anterior pillars, and are covered with dirty pus through which red granulations peep out. Deep crateriform ulcers, like the gummata which precede them, occur with about equal frequency in the posterior wall of

the pharynx and in the velum, whilst ulcerations of the tonsils are by no means rare. The ulcer is deep with clean-cut edges, its base is covered by a yellow slough, and it is surrounded by a well-defined inflammatory area. It extends sometimes rapidly and sometimes slowly, but eventually causes great destruction (Fig. 84).

(3) **Scars and Adhesions.**—

All tertiary syphilitic processes in the pharynx are followed by well-marked cicatrices when healing is established. These give the tonsils a hard nodulated appearance, and the posterior wall of the pharynx a patchy or streaky look (Fig. 85). The appearance of the soft palate varies with the extent of the disease. In some

cases the whole palate is a mass of cicatricial tissue, whilst in other cases there are large perforations. Adhesions are also very

FIG. 84.—Tertiary syphilitic ulceration of the soft palate and tonsils. The uvula and part of the palate have already been destroyed.

common, and may occur in one of the following ways:—
 (a) Adhesions of the posterior pillars of the fauces to the posterior pharyngeal wall, leading through cicatrisation to dragging of the uvula over to the affected side.
 (b) Unilateral or bilateral adhesions of the palate to the posterior pharyngeal wall, greatly reducing the passage from the naso-pharynx.
 (c) Complete adhesion of the palate to the posterior pharyngeal wall, entirely occluding the passage.
 (d) Adhesions between the posterior pharyngeal wall and the

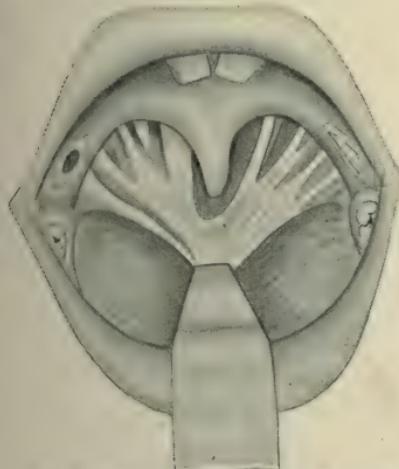
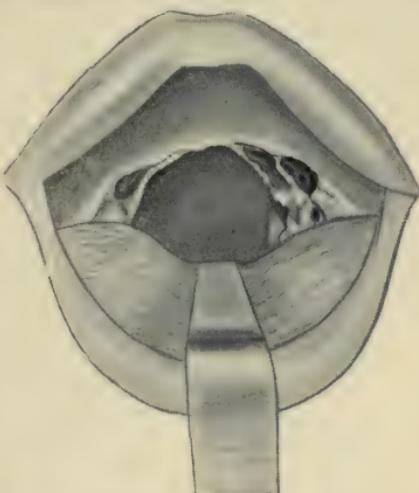


FIG. 85.—Extensive cicatrices of the posterior wall of the pharynx, and perforations surrounded by scar tissue of both anterior faucial pillars (see also Figs. 201 and 202).

base of the tongue. (e) Adhesions of the velum to the base of the tongue.



Tertiary Syphilitic Changes in the Larynx.—(1) Gummata.

—All three varieties also occur in the larynx. They have the usual tendency to break down rapidly, but occasionally remain stationary for a long time without softening.

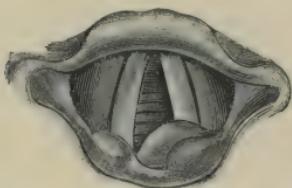


FIG. 86.—Circumscribed gumma.



FIG. 87.—Circumscribed gummata.

Diffuse Gummata are commonly met with as ill-defined smooth rounded swellings of the epiglottis, the arytenoids, or the ventricular bands, though any other part may

be affected. In colour they are deep red, and later a yellow spot is often seen in the centre, which denotes the commencement of softening. Though the swelling itself has no definite margin, the area of injection is well marked (Figs. 90 and 91).

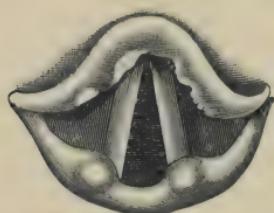


FIG. 88.—Superficial tertiary ulceration of the epiglottis.

Circumscribed Gummata are not very common. They occur as single distinct tumours, most commonly on the epiglottis, arytenoids, or cords (Figs. 86 and 87). They are smooth, rounded in shape, deep red in colour, and often show signs of breaking down.

Small Nodular Gummata are rare; they are multiple, and are seen as small rounded elevations of about the size of a pea, and are often so numerous as almost to coalesce. The cords are most frequently affected.

(2) *Ulceration*.—Superficial ulcers are extremely rare, whilst deep ulceration is the commonest manifestation of laryngeal syphilis. Superficial ulcers, where they occur, are formed as a rule on the epiglottis (Fig. 88). The deep ulcer which is always the sequel of a pre-existing gumma, is punched-out and crateriform, with sharp edges, and a red, swollen, and often oedematous areola. The base is covered with pus and necrotic shreds, which

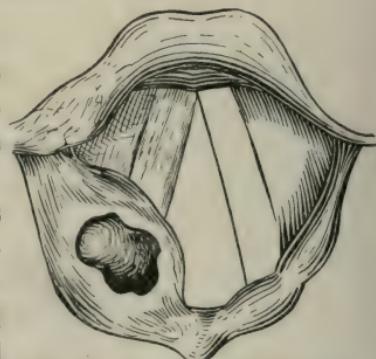


FIG. 89.—Deep ulceration of a circumscribed gumma.

give it a grey appearance. The size varies with the extent of the original infiltration and is therefore greater in the diffuse than in the circumscribed gumma (Figs. 89, 90, and 91). When nodular gummata break down, the ulcers are at first multiple, small, and



FIG. 90.—Diffuse gummatous infiltration and destructive ulceration of the epiglottis.

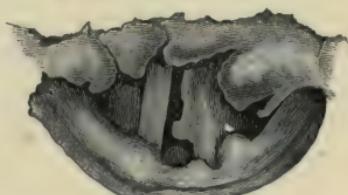


FIG. 91.—Diffuse gummatous infiltration and destructive ulceration of the epiglottis and left ventricular band.

superficial, but they tend to deepen and coalesce, so that finally they may lead to great local destruction.

(3) **Perichondritis and Necrosis.**—The perichondrium of any laryngeal cartilage may be the seat of a gummatous infiltration, or it may be affected by infiltrations spreading from the overlying soft structures. In the early stages, perichondritis is characterised by great swelling and limitation of the movements of the affected part. In the later stages there is ulceration or abscess formation followed by necrosis of the cartilage. When the internal plates of the thyroid are attacked, the disease often assumes a chronic form, in which the cords are pushed inwards, the subglottic region thickened, and the glottis consequently narrowed. Persistent and often dangerous dyspnoea results. (For further details see Chronic Perichondritis, Chap. xxiii.)



FIG. 92.—Cicatricial web between the vocal cords, the result of tertiary syphilis.

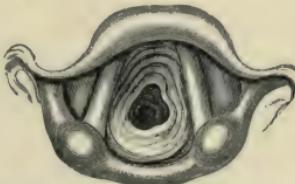


FIG. 93.—Stricture of the trachea, the result of tertiary syphilis.

(4) **Scars and Adhesions.**—The larynx is always left more or less permanently damaged. The epiglottis may be partially or completely destroyed, or it may become adherent to neighbouring structures. The cords may adhere together or be united by a cicatricial web (Fig. 92) which commences in the anterior commissure on the under surface of the cords and spreads backwards,

often leaving but little room for respiration. Similar adhesions may also occur between one cord and the opposite ventricular band. Narrowing of the subglottic region or the trachea (Fig. 93) is not uncommon from contraction of cicatricial tissue. Fixation of one or both cords from true or false ankylosis of the crico-arytenoid joints (Chap. xxiii.) is very common. Hyperplastic outgrowths may occur, often sufficiently large to cause dyspnœa ; and finally, the various structures of the larynx may be so altered and distorted by necrosis as to make it impossible to recognise them (Fig. 94).

Symptoms of Tertiary Syphilis.—Nasal gummata cause slight boring pain at night, and more or less unilateral nasal obstruction.



FIG. 94.—Old cicatrices on the epiglottis: contraction of the walls of the pharynx and horn-shaped outgrowth on left side (Mackenzie).

Pharyngeal gummata may cause mechanical difficulty in deglutition and articulation, and some dull aching pain, which is worse at night. Laryngeal gummata cause discomfort in swallowing, alteration of the voice, sometimes pain, and, if large or situated intrinsically, more or less dyspnœa.

When ulceration and necrosis take place the symptoms become very much more marked. If the nose is affected there is nasal obstruction accompanied by a purulent

blood-stained discharge, often horribly offensive, and large pieces of dead bone may be blown from the nostril.

When the pharynx is affected the chief symptoms are dysphagia and alteration of the voice. The former is sometimes extremely severe, whilst the patient's discomfort is increased by the presence of tenacious muco-pus in the pharynx, which can neither be swallowed nor expectorated. Directly the palate becomes perforated regurgitation of food and drink through the nose is noticed, and the voice assumes the peculiarities characteristic of cleft palate.

When the larynx is affected, pain, dysphagia, dyspnœa, and alteration of the voice are the chief symptoms. The pain is often severe and may shoot up to the ears: dysphagia is most marked when the epiglottis is ulcerated: dyspnœa is fairly common and may be due to hyperplastic outgrowths, perichondritis, impaction of a sequestrum, œdema, fixation or paralysis of the cords, or to the formation of cicatricial webs and adhesions. The voice is chiefly affected when the intrinsic parts of the larynx are involved :

it may be hoarse, hard, and rasping, or weak and whispering, and, if the cords become fixed in such a position as to prevent their approximation, completely aphonic. If necrosis occurs there may be foetor of the breath.

Sequelæ.—When the active processes have ceased various other symptoms may supervene, some of which have already been mentioned. In the nose atrophic rhinitis with ozæna may be established (see p. 308), or adhesions about the alæ may cause partial or complete nasal stenosis. In the pharynx adhesions of the palate to the posterior wall may cause inability to breathe through the nose and to cleanse the nose by natural means, nasal intonation, depreciation of taste, liability to laryngitis and bronchitis, and frequently progressive deafness accompanied by attacks of the most intense earache. In the larynx alteration or loss of voice and dyspnœa often supervene.

Complications.—Various forms of septic poisoning may occur, especially when there is perichondritis and necrosis; septic pneumonia is not uncommon when the larynx is affected, and occasionally cerebral complications occur in nasal cases. Tuberclæ and possibly malignant diseases may occasionally complicate syphilitic lesions. As regards malignant disease, Havilland Hall states that his observations have convinced him that tertiary syphilitic lesions in the larynx may in very rare cases be the starting-point of malignant disease.

Diagnosis.—Tertiary syphilis, whether in the nose, pharynx, or larynx, may be confounded with either tubercle, lupus, or malignant disease. In the majority of cases no difficulty arises, the diagnosis being based on the characteristic pathological changes which have been described. In a few difficult cases a definite diagnosis can often only be made by observing the results of treatment, by examining the sputum, or by the removal and microscopic examination of a portion of the diseased tissue.

The Prognosis of tertiary syphilis entirely depends upon the stage at which it is first seen, and upon the treatment adopted. If seen early and suitably treated, there are fair prospects of obtaining resolution of the disease without any serious damage, but if not seen until the later stages, some permanent deformity will result. As regards life the prognosis is usually good, though death may occur according to the region affected from cerebral complications, from dyspnœa, from exhaustion due to necrosis, or from haemorrhage due to ulceration spreading into the big vessels.

If death from dyspnœa be averted by a timely tracheotomy it is probable that a tube will be permanently necessary. As regards the voice the prognosis is bad, if ulceration of the larynx has occurred. Some hoarseness at least is sure to be left, and in severe cases the voice is seriously damaged and occasionally almost completely lost.

TREATMENT

General Treatment.—This consists, as in syphilis elsewhere, in administering iodide of potassium, and in early cases this is generally all that is necessary. It should be given in doses of from 20 to 30 grs., whilst, during its administration, the patient should have a simple nourishing diet, alcohol and tobacco being strictly prohibited.

In advanced or obstinate cases there is, however, one special feature in the treatment of tertiary syphilis of the throat and nose. Very often iodide of potassium alone, even in very big doses, is ineffectual, whilst the affection will readily yield to iodide of potassium and mercury combined. The best way of administering the mercury in these particular cases is by inunction. This should not, unless absolutely necessary, be left to the patient. Poor folk must be admitted into hospital, and those who can afford it should obtain the services of a trained nurse.

To get the full effect of this treatment the patient is kept in bed and his diet restricted to fish, vegetables, and eggs, with plenty of milk, alcohol being absolutely forbidden. Immediately before using the inunction the patient is given a hot bath, and then $\frac{1}{2}$ dr. of blue ointment is well rubbed into the skin (see p. 147). If the iodide of potassium is well tolerated it should be pushed up to doses of 40 grs. every six hours.

When the patient is unable to devote the necessary time to treatment by inunction, intra-muscular injections of mercury may be tried. At one time this method was often used for syphilis of the upper respiratory tract, but, though excellent results were obtained, it fell more or less into disuse owing to real and supposed dangers. Local abscess, rapid salivation, and emboli were feared and sometimes met with. Recently this method has been again more extensively used and with excellent results. Lambkin strongly recommends it as the best way to get and keep

the patient under the influence of the drug. He bases his opinions on an experience of 3000 patients whom he has thus treated without untoward accident of any sort. Though biniodide, perchloride, and subchloride of mercury have all been employed with success, he strongly advises the use of metallic mercury prepared as follows :—

Mercury	$\frac{1}{2}$ oz. = 15 gm.
Lanolin	2 oz. = 60 gm.
Liquid paraffin (carbolised 2 per cent.)	to 5 oz. = 150 gm.

The mercury and lanolin must be thoroughly and slowly rubbed together in small quantities, two hours being taken in getting them uniformly mixed. The paraffin is next added and well stirred, and the mixture is poured into a glass bottle without angles or corners. Before use it must be well stirred with a boiled glass rod.

The finished product contains one grain of mercury in ten minims, and the maximum dose is 10 minims once a week.

It is injected into the gluteal muscles with strict antiseptic precautions. The syringe, which must be all glass with a platino-iridium needle, is boiled, and the skin disinfected with perchloride of mercury solution (1 in 500) before the injection is made.

Some form of hot bath and plenty of exercise are important adjuncts to the treatment.

In very acute cases where tertiary ulceration occurs unusually early after the primary infection, Lieven recommends calomel injections because of their rapid action.

If by strict attention to details, intra-muscular injections can be carried out without fear of accident, they should prove a valuable method of controlling syphilis and promoting healing of its manifestations with a minimum amount of worry and discomfort to the patient.

Occasionally, when much out of health, the patient cannot endure the depressing effects of any of these methods and the local lesions get worse in spite of them. In such cases the patient should be put to bed and kept absolutely quiet; he should be fed as freely as his digestion will permit, and be given full doses of iron and strychnine three times a day. If there is a tendency to constipation doses of 30 grs. of sulphate of sodium should be given in addition. Cod-liver oil may also often be administered with great advantage if there is much wasting. As the patient improves in general health mercurial

inunction may be commenced, and later iodide of potassium and iron should be given as under:—

R.	Iron and citrate of ammonia	10 gr. = 0·68 gm.
	Carbonate of ammonia	5 gr. = 0·34 gm.
	Potassium iodide	30 gr. = 2·06 gm.
	Spirits of chloroform	m.x. = 0·62 c.e.
	Water	to 1 oz. = 30 c.e.

Danger of Iodide of Potassium.—When dealing with laryngeal cases in which there is much stenosis, it must be remembered that iodide of potassium often increases the swelling and oedema at first, and so may possibly cause dangerous dyspnoea. If there is much narrowing of the glottis this drug must, therefore, be given with extreme caution, unless the patient is in hospital, or so situated that immediate surgical help can be obtained if necessary. Failing this, mercury alone should be used at first, which will decrease the swelling to a certain extent, and iodide of potassium can then be given with comparative safety.

Local Treatment.—Local treatment consists in keeping the part absolutely clean by means of antiseptic powders and lotions, and in the removal of exuberant granulations, sequestra, and fibrous granulomata. Finally, the deformities and ill effects of scars and adhesions must as far as possible be counteracted by operative measures.

(a) **In the Nose.**—**Cleansing and Local Applications.**—Directly ulceration occurs the nasal cavities must be kept clean by the frequent use of Coll. Alkalimum (p. 29), and superficial ulcers painted with chromic acid (p. 36) under cocaine anaesthesia (p. 63). Deep ulcerations must be dried with swabs of cotton wool, and their surfaces covered with iodoform powder used by means of an insufflator. If stinking crusts are present they should be loosened, if necessary, with peroxide of hydrogen and then removed by syringing and attempts should be made to prevent their re-formation by the constant use of alkaline lotion (p. 29), followed by the Nebula Hydrargyri Nitratis (p. 50). If this is not successful the nose must be packed with double cyanide gauze, which should be removed night and morning and fresh gauze inserted after washing the nose thoroughly. The patient will soon learn to do this for himself (p. 311). It has a marked effect in preventing the formation of crusts and in keeping the mucous membrane clean and moist. If exuberant

granulation tissue is present, the disease may often be arrested and healing promoted by the insufflation of heated calomel. For this purpose 2 or 3 grs. of calomel are placed in the receiver of a special porcelain insufflator under which a spirit lamp is arranged (Fig. 95). This is lighted, and as soon as the calomel begins to vaporise the insufflator is placed in position under the guidance of a good illumination, and the vapour blown on to the affected part. This should be repeated every other day. If the means for this are not at hand, the granulations and the edge of the ulcer may be painted with acid nitrate of mercury (p. 37).

Removal of Necrosed Bone.—If large pieces of necrosed bone can be discovered buried in the granulations, a general anæsthetic having been administered, the sequestrum should be removed by means of forceps and the granulations thoroughly scraped away

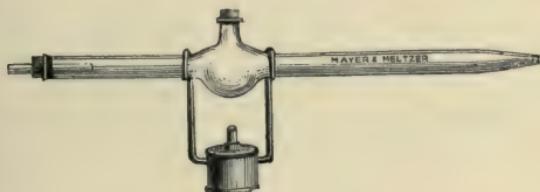


FIG. 95.—Calomel insufflator.

with a Meyer's ring knife (Fig. 121, p. 242). It is possible that this operation may have to be repeated, for owing to the profuse haemorrhage it is difficult to make sure of reaching and removing the whole of the diseased tissue at one operation. Afterwards the nose is kept thoroughly clean and iodoform insufflated.

Treatment of Atresia of the Nostrii.—Cases of partial atresia are best left alone, since the contraction after operative interference often leaves the patient with a smaller opening than before. Some relief may be given by inserting small india-rubber tubes or Francis's supports (p. 350) which the patient can wear, removing them night and morning for the purpose of cleaning them. If there is *complete atresia* an attempt may be made to dissect away the cicatricial tissue and to open up the passages. The openings must be kept patent by the use of india-rubber tubes for many months, after which occasional dilatation with a bougie may be sufficient to maintain the patency. Good results are, however, rather the exception than the rule, for in spite of all possible devices the lumen slowly re-contracts until complete closure is again established.

Treatment of External Deformities.—Paraffin Injections.—Recently this simple means of improving the shape of a “saddle-back” or “bull-dog” nose has been introduced by Gersuney in Germany and brought before the profession in this country by Spicer and Paget. If the patient is really anxious to have something done, it is probably the best method of treatment. It consists in the subcutaneous injection of melted paraffin and the moulding of it to the desired shape. The one essential is that there should be sufficient loose skin to allow of the injection. The details of the operation are as follows: The skin of the nose is rendered aseptic, and some prepared sterilised paraffin, having a melting-point of from 110° to 115° F. (44.3° to 46.1° C.), and two Eckstein’s syringes (Fig. 96), are placed in a water bath maintained at a temperature 6° or 7° above the melting-point of the paraffin. The patient is anæsthetised, and the

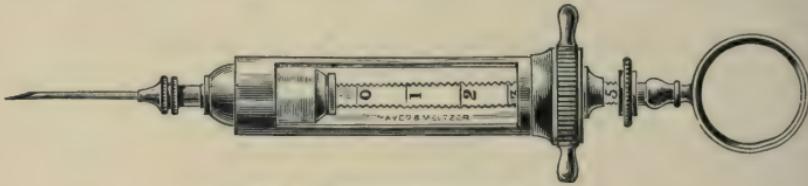


FIG. 96.—Eckstein’s paraffin syringe.

skin is nicked with a knife to receive the point of the syringe at a point a little below the sunken part to be restored and a little to one side of the middle line. A sponge is held on this whilst the syringe is filled to the extent of 5 or 6 c.cm. of paraffin, and the screw nut, which is affixed on the piston to prevent its going in with a jerk, is adjusted. The needle of the syringe is then held in boiling water for a few seconds and inserted as quickly as possible into the nick in the skin, and the paraffin is slowly injected at the rate of 1 c.cm. every ten seconds. An assistant in the meanwhile must make steady pressure all round the “root” and sides of the nose to prevent any leakage of paraffin on to the forehead or into the eyelids. The paraffin begins to “set” at once, and remains sufficiently soft for moulding purposes for only a few minutes. The moulding must, therefore, be at once commenced and executed vigorously, and it must be continued until the paraffin is quite hard. A small collodion dressing is placed over the wound, and when the patient is back in bed, cold compresses are placed over the nose. The average quantity of paraffin required is about 7 or 8 c.cm. It is better to inject

too little than too much, for a second small injection can always be made subsequently under cocaine anæsthesia.

This method, recommended by Paget, is the one generally adopted, but Spicer and others prefer to use a paraffin with a melting-point of 136° F., which, owing to the extreme rapidity with which it sets, runs less chance of finding its way into the eyelids. There is, however, considerable risk of causing real burning of the tissues, or at all events some discolouration, when working with a paraffin having so high a melting-point. Recently Mahu has recommended the injection of cold paraffin, having a melting-point of 113° F., by means of a special syringe. This greatly simplifies the operation, and as a rule renders general anæsthesia unnecessary.

Results.—Though injections of paraffin generally improve the shape of the nose, the results are not altogether pleasing, and sometimes distinctly unpleasing, whilst occasionally a worse deformity is left than the one which the injection was hoped to cure. Finally, Kirschner has thrown considerable doubt on the permanency of the result.

External Operations are dealt with in books on general surgery, to which the reader is referred. Various plastic operations may be undertaken, but they are not as a rule very successful in their results.

(b) **In the Pharynx.**—**Local Applications.**—Superficial ulcerations must be cleansed and pure chromic acid applied (p. 37); whilst deep ulcers after being washed with the alkaline spray should be dried and insufflated with iodoform. If there is much pain or dysphagia an equal part of orthoform should be added to the iodoform, which will often give relief for as long as twenty-four hours. If the granulation tissue is very profuse, heated calomel may be used as directed for the nose (p. 159). In very bad cases time may be saved by curetting the ulcer and surrounding granulations with a sharp spoon under cocaine anæsthesia. The patient can be given for home use the mercury and chlorate of potash gargle (p. 57), which relieves pain and promotes healing.

Adhesions.—The treatment of adhesions of the palate to the posterior wall of the pharynx is a very difficult matter. If there is not complete atresia and urgent symptoms are absent, no operative measures should be undertaken, for though it is easy enough to make a larger opening, it is often impossible to maintain it. Attempts may, however, be made to dilate or at any

rate keep open such aperture as exists by the passage of bougies or the insertion of plugs or tubes. The daily passage of a bougie is simple and often efficacious, and the patient can soon do it for himself.

If the atresia is complete and accompanied by increasing deafness, constant and intense ear-ache, frequent attacks of bronchitis, or great discomfort due to nasal stenosis, an attempt may be made to restore a passage from the naso- to the oro-pharynx. Various plastic operations have been devised for this purpose; but that recommended by Spencer is as useful and as simple as any. It is carried out thus: The patient is anaesthetised, a Smith's or Whitehead's gag inserted into the mouth and opened as wide as is compatible with the safety of the anaesthetic. The line of junction between the palate and the pharyngeal wall is then divided, and the dense fibrous tissue, which is often found in the naso-pharynx, is separated with cleft palate raspatories helped if necessary by instruments passed through the nose. When the soft palate has thus been separated, it is drawn forward and fixed by two silk sutures to the muco-periosteum of the hard palate. The sutures are left in position until they cut themselves out, which generally occurs in the course of a week. In a successful case it will then be found that there is firm union between the soft and hard palates. The opening into the naso-pharynx must be kept free by the passage of bougies and the occasional stretching of the parts by means of a blunt hook. The bougies must be passed daily for some weeks and then less often, whilst the stretching should be done once a fortnight for several months. There is generally very free haemorrhage during and after the division of the adhesions and, therefore, in old standing cases the above procedure may be greatly facilitated by a preliminary laryngotomy.

Fortunately very extensive and even complete obliteration of the passage from the naso-pharynx to the oro-pharynx may exist without causing any serious symptom, and often without even discomfort to the patient, so that this operation is not very frequently necessary.

(c) **In the Larynx.**—**Local Applications.**—An uncomplicated and limited tertiary ulceration will generally get well without any local measures if the patient faithfully follows out the general treatment. If, however, the ulcer is covered with dirty yellow pus and necrotic shreds, the larynx should be washed with

alkaline spray (p. 31), and iodoform, iodol, or aristol blown on to its surface. If there is much pain insufflations of orthoform or morphia (p. 43) may be used. If exuberant granulations are present, calomel vapour can be employed (p. 159), and if there is much tendency to oedema the patient must constantly suck ice, and all his food should be cold and either liquid or semi-solid. If there is a tendency to the formation of adhesions and webs about the vocal cords, preventive treatment may be tried. The case should be carefully watched, and any young adhesions which may form should be broken down by means of a probe, and the edges of the cord painted with nitrate of silver (30 gr. to 1 oz.) or copper sulphate (30 gr. to 1 oz.).

The Treatment of Dyspnoea arising in the course of laryngeal

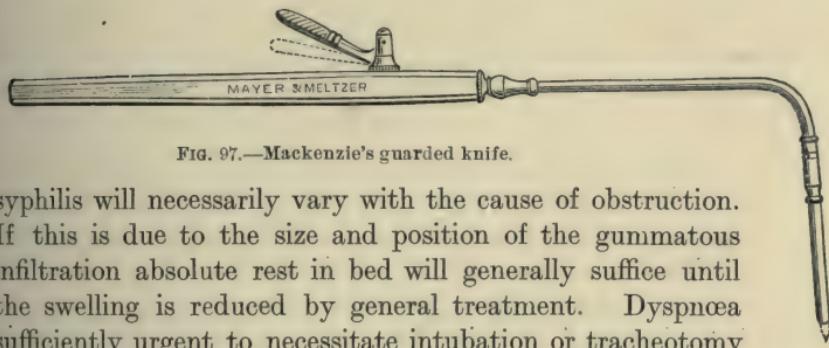


FIG. 97.—Mackenzie's guarded knife.

syphilis will necessarily vary with the cause of obstruction. If this is due to the size and position of the gummatous infiltration absolute rest in bed will generally suffice until the swelling is reduced by general treatment. Dyspnoea sufficiently urgent to necessitate intubation or tracheotomy is very rare from this cause.

If it is due to oedema and not very urgent, scarification should first be tried. The larynx should be anaesthetised with cocaine, and two or three distinct incisions should be made into the oedematous part (p. 497) by means of a Mackenzie's guarded knife (Fig. 97). Directly afterwards, bleeding and exudation should be encouraged for a short time by means of warm applications to the neck and steam to the interior of the larynx. When bleeding has ceased the patient should suck ice, and take only cold food. If this gives no permanent relief and the dyspnoea increases, tracheotomy (p. 77) must be performed before the patient's general condition becomes really grave.

If the dyspnoea is due to impaction of a sequestrum in the glottis, an effort should be made to remove it with laryngeal forceps, if time permits. If the symptoms are urgent, laryngotomy or tracheotomy should be performed, and the sequestrum afterwards removed by intra-laryngeal means. It is sometimes possible

to push it into a more advantageous position for seizure with a laryngeal forceps by means of a bent probe passed through the tracheotomy wound.

If the dyspnoea is due to large hyperplastic outgrowths obstructing the air-way, the larynx should be thoroughly cocainised (p. 65), and the growths removed by means of a forceps or snare, in the manner recommended for papillomata (Chap. xxv.). They are often very tough, so that it is necessary to use some form of cutting forceps.

If it is due to ankylosis of the crico-arytenoid joints with fixation of the cords in the middle line, to bilateral abductor paralysis, or to extensive adhesions, contractions, or deformities, tracheotomy should be performed as a temporary measure for the relief of dyspnoea. Later, when all signs of active disease have ceased, one of the methods mentioned below for laryngeal stenosis must be adopted.

Treatment of Permanent Stenosis.—1. *Adhesions between the Larynx and Pharynx.*—Stenosis due to this cause practically never causes dyspnoea, and seldom any difficulty in swallowing. No surgical interference should be attempted, as the results are by no means satisfactory, and a greater amount of contraction often results. If the passage of food is menaced, a bougie may be passed daily to prevent further contraction.

2. *Intra-laryngeal Stenosis.*—For the relief of laryngeal stenosis the choice lies between thyrotomy and a permanent tracheotomy tube.

When the stenosis is due to webs or adhesions and the larynx is otherwise clear, thyrotomy is probably the best method of treatment. The interior of the larynx should be exposed to view (p. 82), all adhesions broken down, and the web or other obstructing bands dissected away according to circumstances. The thyrotomy wound is then united by sutures, but a specially designed tube should be retained in the trachea through which a metal plug or tube can be passed upwards into the larynx. This must be worn for about six months, at the end of which time both it and the tracheotomy tube can usually be removed with a fair prospect of a permanent success. A solid plug (Fig. 98) is preferable to a tube, because it is easier to introduce and does not collect secretions, and therefore does not so often need removal for cleaning.

In very severe deformities, such as may be left after necrosis,

a permanent tracheotomy tube is the simplest and generally the best method of treatment, and should as a rule be adopted. Occasionally, however, patients find the tube so inconvenient that they are willing to undergo any operation in the hope of getting rid of it. In such cases it is justifiable to perform laryngo-fissure and dissect away all obstructing tissues. The operation is likely to be attended with free haemorrhage and, therefore, a Hahn's tracheal cannula is necessary to prevent the entry of blood into the lungs. When the haemorrhage has ceased a tracheotomy tube with a metal plug should be inserted and worn for many months. In some cases this may be successful, but disappointments are frequent owing to fresh adhesions and contractions.

Thyrotomy and the removal of the vocal cords for the relief of stenosis due to paralysis or fixation of both cords in the middle line has been suggested, but it must be remembered that total loss of voice would be likely to occur, and that cicatricial bands are almost sure to form and replace the cords, often causing a return of dyspnoea.

Other Methods.—Schroetter has recommended the gradual dilatation of the larynx by means of special vulcanite tubes introduced through the mouth, and Newman suggests tupelo wood tents introduced through a tracheotomy wound.

Various intra-laryngeal methods have also been recommended, such as the division of adhesions with a guarded knife, with a cautery, or with Whistler's cutting dilator. All these methods were at one time extensively employed, but they are difficult to carry out, and wearisome to the patient, while the results are very uncertain.

In slight and medium cases thyrotomy offers the best chance of success, whilst in severe cases a permanent tracheotomy tube will most probably give the patient the greatest relief.

D. HEREDITARY SYPHILIS

In hereditary syphilis the pathological changes are similar to those of the acquired form. The secondary symptoms usually commence soon after birth, and are always most marked during the first six months of life. It is difficult to determine at what

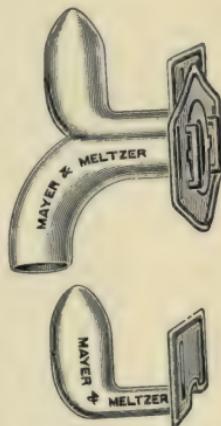


FIG. 98.—Lack's tube and plug.

age definite tertiary lesions may first commence, owing to the impossibility of making a satisfactory examination. They are said by some to follow the secondary stage very quickly and to cause extensive ulceration and destruction. Though this may occur in rare instances within the first few months of life, in actual practice tertiary lesions are not often recognised before the age of three or four years, and the commonest age for their appear-



FIG. 99.—Saddle-back nose, the result of hereditary syphilis.

ance is at or about puberty. Occasionally they commence considerably later, when it is often difficult to say whether the lesion is of hereditary or acquired origin.

The Secondary Stage.—In the nose the earliest symptoms are those of catarrhal inflammation of the mucous membrane, causing more or less nasal obstruction and “snuffles.” There is at first an irritating watery discharge, which runs from the nostrils and causes excoriation of the alæ nasi and lips. Later the discharge becomes muco-purulent or purulent and sometimes dries and forms crusts, which increase the nasal obstruction and may prevent the child sucking the breast, and lead to dyspnoea during sleep. As a sequel to the intra-nasal changes causing these

symptoms, more or less deformity of the nose, generally of the saddle-back variety (Fig. 99), is very common, and when marked causes great disfigurement. The exact cause of the deformity is unknown, but it seems certain that it may occur without any evidence of destructive ulceration or necrosis of the septum and nasal bones.

In the pharynx, erythema of the mucous membrane and mucous patches occur at about the same time as the snuffles, and the hoarse, weak cry of the infant suggests that similar changes may be present in the larynx. Instances of severe dyspnoea necessitating tracheotomy have been reported.

Accompanying these local symptoms there are generally signs of syphilis elsewhere, such as a rash, mucous patches about the anus, and marasmus.

The Tertiary Stage.—Gummatus infiltration and deep ulceration are fairly common in the nose and pharynx, but are much less frequently seen in the larynx. In the nose the gummata are generally of the nodular variety, and are often seen about the lips, alæ nasi and vestibule, as well as on the septum and turbinals. Their course is slow but steadily progressive, and though at first ulceration is superficial, eventually extensive and deep destruction takes place, and external deformities similar to those described under acquired syphilis often result. In the pharynx the tertiary lesions may in every way resemble those of the acquired disease and be followed by similar adhesions and deformities, but often the disease is characterised by its slow rate of progress and by the absence of pain or even discomfort: the gummata are nodular in character, and the ulceration for a long while remains superficial. In the larynx the epiglottis is most often affected, but other parts may be involved and stenosis may result from contraction and adhesions. Though puberty is the age at which the larynx is likely to become involved, there seems to be some evidence from post-mortem examination that syphilitic necrosis of the laryngeal cartilages may occur in infancy.

Diagnosis.—In the slowly progressive form of nodular infiltration in the nose and pharynx it is sometimes impossible to make a diagnosis between hereditary syphilis and lupus by inspection. As a rule the syphilitic lesion is steadily progressive and shows signs of surrounding inflammation, whereas lupus heals in one place and breaks down in another and shows no signs of inflamma-

tion (p. 133). If nodules are found on the gums round the teeth, the disease is almost sure to be lupus. In doubtful cases anti-syphilitic treatment should be adopted, which will often clear up the diagnosis; but if doubt still remains, a portion of the ulcerating edge should be removed and submitted to microscopical examination.

General Treatment.—In the secondary stage mercury may be given either internally, or by inunctions of blue ointment. Internally 10 minims of solution of perchloride of mercury should be given twice daily in milk.

Inunctions can be employed either by rubbing 10 or 15 grs. of the blue ointment into the thighs, buttocks, and axillæ alternately, or by spreading half to one drachm of the ointment, diluted with an equal part of lanolin, on a flannel roller, and applying it to the thigh or abdomen, keeping it in position with a few stitches. This should be removed and renewed daily. Mercurial treatment should be continued with occasional intermissions for from three to six months. After the first three months, one or two grains of iodide of potassium, mixed with milk or cod-liver oil, may be given in addition to the mercury.

In older children and adolescents mercury and iodide of potassium should be combined in the following mixture, and given three times daily:—

R.	Iodide of potassium	3-8 gr. = 0.19 to 0.55 gm.
	Solution of perchloride of mercury	15-30 m. = 0.95 to 1.87 c.c.
	Tincture of nux vomica	1-3 m. = 0.06 to 0.18 c.c.
	Carbonate of ammonium	2-5 m. = 0.12 to 0.31 c.c.
	Syrup of ginger	$\frac{1}{2}$ dr. = 1.87 c.c.
	Aqua	to $\frac{1}{2}$ oz. = 15 c.c.

In some cases of obstinate ulceration simulating lupus, the iodide of potassium may be needed in larger doses before the ulcer will heal.

Proper attention to diet, clothing, and general hygiene are very important. Cod-liver oil is most useful when there is much wasting. It may be given internally or rubbed into the skin after a hot bath. If the nose is so obstructed as to prevent infants from sucking, spoon feeding will have to be adopted.

Local Treatment.—It is most important to cleanse the nasal cavities and keep them free from crusts and discharge. The Coll. Alkalimum, mixed with equal parts of warm water, is the best

cleansing medium, and should be applied at least night and morning by means of a spray or a syringe, or dropped into the nostrils from saturated cotton wool, as recommended under acute catarrh (p. 198). In the pharynx, ulcerations should be cleansed by means of diluted alkaline lotion used as a spray, and afterwards dusted with equal parts of iodoform and starch. In older children healing may be promoted by painting the ulcers with chromic acid (30 gr. to the oz.) or bicyanide of mercury (10 gr. to the oz.).

In the larynx local measures are generally impossible in the case of infants, but in older children the parts may be kept clean with alkaline lotion and iodoform may be insufflated. Tracheotomy is sometimes necessary to avert death from dyspnoea.

II. LEPROSY

Leprosy frequently attacks the mucous membrane of the upper respiratory tract. Recent investigations show that the nose is very much more frequently involved than either the pharynx or larynx, and that nasal leprosy occurs simultaneously with the cutaneous disease, or even sometimes precedes it. It is thought by some (Stickler and others) that the first effects of leprosy are to be found in the nose, and that the nasal secretions, which are nearly always crowded with bacilli, are the most important channel by which the disease is spread from one person to another.

Pathological Changes and Symptoms.—The early appearances in the nose are characterised by a diffuse infiltration of the septum, swelling of the inferior turbinates, and injection of the mucous membrane. Later, slight and quite superficial ulceration may occur at the junction of the cartilaginous and bony septum accompanied by a muco-purulent secretion, which has a tendency to form crusts. Small yellow shiny elevations of the size of split peas are seen on the posterior end of the septum and upper margins of the choanae. Later, further infiltration occurs, which finally breaks down and ulcerates, causing destruction of the cartilaginous septum, the inferior turbinates, and even the vomer and the nasal bones.

In the pharynx the pillars of the fauces and the uvula are most usually involved and, less frequently, the tonsils and hard palate. Greyish white or blue elevated infiltrations appear, which break down and lead eventually to scars and adhesions.

In the larynx the epiglottis is most commonly attacked. It is uniformly swollen and studded with small nodules. In severer cases the ary-epiglottic folds, the ventricular bands, the posterior wall of the larynx, and sometimes the cords and subglottic region, become greatly thickened and nodular, gradually reducing the air-way to a small circular opening. The voice becomes rough and hoarse, the breathing increasingly difficult, and recurring attacks of dyspnoea are not unusual. Sooner or later there is ulceration, but as a rule this tends to heal, leaving the mucous membrane shrunk and depressed, though the ulcers may spread deeply, and cause perichondritis and necrosis.

These various changes in the mucous membranes progress slowly, and the patient generally succumbs to the general affection before the later and destructive stages are reached locally.

The Diagnosis.—Difficulty in diagnosis can only arise in the early stages of nasal leprosy before the cutaneous disease develops. Later, though the local signs may resemble tubercle, syphilis, and possibly cancer, the co-existence of the cutaneous affection will remove all doubt.

Treatment.—Local treatment does not seem to have much power to check the onward course of leprosy of the upper respiratory tract. The destruction of the nodules one by one by means of the electric cautery has been recommended. When ulceration has occurred the parts should be rendered clean by the use of an alkaline lotion and some antiseptic applied. Iodoform, either as a powder or in ethereal solution, or resorcin, 1 per cent. solution, are recommended. Occasionally the constriction of the larynx may render tracheotomy necessary for the relief of dyspnoea.

III. GLANDERS

This disease is due to infection with the bacillus mallei, which is generally conveyed to man from horses by means of the nasal secretions. It is characterised by the formation of miliary nodules in the mucous membrane, which undergo ulceration. The ulcers coalesce and form large ulcerated areas, which are often covered by a foul blood-stained secretion. The disease tends to spread deeply, destroying cartilage and bone.

Clinically, the disease may follow either a chronic or acute course. In the chronic form the symptoms at the onset are those of an ordinary cold in the head, with the exception that

the discharge is generally at first absent; later it is scanty, mucoid, and streaked with blood, and later purulent and foetid. There may be some feeling of heat in the throat accompanied by hoarseness. Later, dry black crusts appear in the nose, and the mucous membrane becomes swollen, and infiltrated, and finally ulcerated.

The acute form is ushered in by distinct febrile disturbance, which is followed by the appearance of a cutaneous rash in the form of red patches, which quickly become pustular, and simulate variola. This rash spreads to the mucous membranes of the nose, pharynx, and larynx, and quickly leads to ulceration and destruction of the tissues. In the nose the septum, the nasal bones, and the turbinates may be destroyed, and the accessory sinuses involved. In the pharynx the soft palate may be lost, and in the larynx erosion of the vocal cords and destruction of any of the cartilages may occur, whilst occasionally acute œdema may supervene. The disease often assumes a pyæmic type.

In the acute form death invariably results, but in the chronic a considerable number of recoveries take place.

Treatment.—Nothing can be done to alter the course of the disease, so that the local treatment resolves itself into the relief of symptoms as they arise. Great care must be exercised in preventing the spread of the disease to others. It must be remembered that all the secretions are highly infective, and they must be dealt with accordingly.

IV. RHINOSCLEROMA

This rare disease occurs chiefly in Russia, Eastern Austria, and Central America, but so far as is known never originates in this country. It is in all probability due to a micro-organism, which in some way leads to the development of fibrous tissue of extreme density. The disease usually commences in the upper lip or alæ nasi, and thence invades the nose. The pharynx, larynx, jaw, hard palate, and even the tongue may also be involved in the course of time. It is characterised by the formation of red, flat, slightly elevated nodules of cartilaginous hardness, which occur singly or massed together. They show no tendency to ulceration, but the fibrous tissue may contract, causing considerable alteration in the contour of the affected parts, and leading to nasal obstruction, impairment of the functions of the

palate, and laryngeal stenosis according to the region involved. Both the infiltration and the contraction are extremely slow in their progress, and are characterised by an entire absence of inflammatory symptoms. The disease may last many years and does not directly endanger life except when the larynx is affected, in which case death may occur from asphyxia unless prevented by a timely tracheotomy.

The diagnosis is based upon the chronicity of the disease, the cartilaginous hardness of the infiltration, and the absence of ulceration. Nothing can be done in the way of curative treatment, but an attempt must be made to keep the passages open. In the nose the use of the electric cautery and the extirpation of portions of infiltrated tissues have been practised with some success. In the larynx dilatation may be tried, but eventually a tracheotomy will probably be necessary.

CHAPTER VII

COMPLICATIONS OCCURRING IN ORGANIC AND CHRONIC CONSTITUTIONAL DISORDERS

Lungs—Mediastinum—Heart—Aneurysms—Digestive System—Blood and Lymph Systems—Rickets—Acromegaly—Diabetes—Gout—Rheumatism—Kidneys—Skin—Sexual Functions—Nervous System.

Diseases of the Lungs.—Apart from tuberculosis, which has already been dealt with, complications of the upper air passages are not very common in lung disease. They include chronic laryngitis and pharyngitis, haemorrhages, ulceration, and paralyses.

Chronic Laryngitis and Pharyngitis are met with in any chronic lung disease which is accompanied by expectoration. The severity of the inflammation is directly proportionate to the amount of secretion and the difficulty of expectoration, and is due partly to the irritating nature of the secretion, and partly to the mechanical irritation of hawking and coughing. These complications are most often met with in bronchitis and emphysema, in which affections the expectoration is very plentiful and tenacious. The appearances and the treatment differ in no way from those of ordinary chronic pharyngitis and chronic laryngitis.

Haemorrhages.—In any lung trouble, which leads to excessive straining and coughing, haemorrhages from the mucous membrane of the upper respiratory tract may take place. Apart from this, in chronic emphysema the blood vessels of the mucous membrane may become passively congested, and may rupture spontaneously and cause haemorrhage. The bleeding from these causes is generally very slight, being limited as a rule to streaks of blood in the sputum. Spitting of pure blood, especially in any quantity, very rarely indeed arises from the pharynx or larynx, unless gross lesions such as tumours or ulcerations are present to account for it (Kidd). Such bleeding as does occur from the pharynx and larynx can usually be controlled by the use of ice and absolute rest.

Ulceration.—A few cases of ulceration of the larynx have been reported in croupous pneumonia. If the patient is sufficiently

convalescent to render local treatment feasible, healing may be promoted by keeping the larynx clean and by using a stimulating spray.

Paralyses.—Either abductor paralysis or complete paralysis of one of the cords may complicate some lung diseases. It is due to pressure on the recurrent laryngeal nerve by consolidated lung or thickened pleura, or to its entanglement in pleural scars and adhesions. The right recurrent nerve is more likely to be involved than the left owing to its position between the subclavian artery and the apex of the right lung. Paralysis is most often met with in chronic thickening of the pleura, or in fibrosis of the lung, whether tuberculous or otherwise.

Diseases of the Mediastinum and Neck.—Paralysis of the vocal cords and dyspnœa are the two conditions likely to be found.

Paralyses are due to entanglement of, or pressure on, one or other of the recurrent laryngeal nerves, more commonly the left owing to its longer course. In the neck malignant disease of the œsophagus, of the lymphatic glands, and of the thyroid gland are the commonest causes, whilst in the mediastinum aneurysms (see below), malignant growths, and enlarged bronchial glands in tuberculosis and still more often in lymphadenoma, are often responsible.

Dyspnœa.—Similar troubles and many innocent growths in the neck may cause pressure on, or displacement of, the trachea or bronchi, leading to dyspnœa characterised by persistent laboured and noisy inspiration with occasional acute attacks, sufficiently severe to cause cyanosis. On examining such cases laryngoscopically the displacement or constriction of the trachea can often be seen, or the larynx may be found rotated to one or the other side. In infants, enlargement of the thymus is said by some surgeons to account for certain cases of infantile inspiratory stridor and occasionally sudden death. Again, in children paroxysmal dyspnœa may be due to, and is often the only symptom of, tuberculous bronchial glands.

Diseases of the Heart.—The complications of diseases of the heart found in the upper respiratory tract are haemorrhages, passive congestion of the mucous membrane, oedema, and paralysis.

Hæmorrhages occur in any condition leading to venous stasis or high arterial tension. It is therefore met with in all forms of valvular disease, especially in mitral disease when compensation

has failed, and in arterio-sclerosis. Epistaxis is by far the commonest form of haemorrhage ; bleeding from the pharynx or larynx being extremely rare. In epistaxis the bleeding generally comes from the septum at the spot of predilection (p. 376), but occasionally from the turbinated bodies. For treatment, see p. 377.

Passive Congestion of the Mucous Membrane is met with in similar conditions to the above. All mucous membranes suffer in common, that of the upper respiratory tract not being specially involved.

Œdema.—In late stages of any cardiac diseases which retard the return of venous blood to the heart, passive œdema of the larynx is said to occur and give rise to dyspnoea.

Paralysis.—Left-sided abductor paralysis has been known as a result of pericardial effusion.

Aneurysms.—Paralysis, pressure stenosis, and ulceration may be caused by aneurysms.

Paralysis.—Abductor paralysis, or more often complete recurrent paralysis, is commonly met with as a result of injury to the recurrent laryngeal nerves by pressure of aneurysms, and especially those of the arch of the aorta. The paralysis is therefore very much commoner on the left side of the larynx than the right owing to the course of the left recurrent nerve round the arch of the aorta ; though, as Osler remarks, if the ascending portion of the arch is affected, the tumour often tends to grow to a large size and pass into the right pleura, in which case paralysis of the right vocal cord may occur. Paralysis may also be caused by aneurysms of the subclavian and possibly of the carotid arteries. Occasionally aortic aneurysm may cause a bilateral paralysis.

Complete paralysis of the left vocal cord is always extremely suggestive of an aneurysm of the arch of the aorta, and is sometimes the first and even the only sign to be detected. In any case, therefore, of left recurrent paralysis, unless some other obvious cause can be detected, the chest must be carefully examined, and even if no signs of aneurysm can be discovered, it is safer to assume for a time at any rate that one exists.

Pressure Stenosis and Ulceration.—The trachea or left bronchus may occasionally be constricted by pressure of an aneurysm. If the constriction can be seen with a laryngoscope, it may be observed to pulsate, and occasionally the mucous membrane covering it will be seen to be red and granular or distinctly ulcerated. The constriction is accompanied by dyspnoea of a paroxysmal nature,

by a want of breath in speaking, and by a peculiar brassy incomplete and ineffectual cough. Slight haemorrhages may occur from the unhealthy mucous membrane over the constriction quite independently of any rupture of the sac, which is invariably and rapidly fatal.

Diseases of the Digestive System.—(a) **The Teeth.**—Nasal, pharyngeal, and laryngeal affections may be secondary to disease of the teeth. Thus an abscess of the septum or floor of the nose may be secondary to acute inflammation around an incisor; suppurative disease of the maxillary antrum may be caused by caries or suppuration at the root of a tooth, or by periostitis of the alveolar border; acute pharyngitis is not uncommon in connection with periostitis around a molar, whilst some cases of septic cedematous pharyngitis and laryngitis have been traced to septic conditions of the teeth.

(b) **The Mouth.**—Nearly any form of stomatitis may spread from the mouth to the soft palate and even farther back, and septic stomatitis is occasionally the starting point of acute septic pharyngitis and laryngitis.

(c) **The Oesophagus.**—A malignant growth in the upper part of the oesophagus may directly encroach upon the larynx and infiltrate the abductor muscles, causing paralysis of the cords. When occurring lower down it may involve the recurrent laryngeal nerves and lead to abductor paralysis. The paralysis, in whichever way it is caused, is generally bilateral, so that dyspnoea will result and often necessitate tracheotomy.

(d) **The Stomach and other Digestive Organs.**—*Dyspepsia.*—Disorders of the upper respiratory tract may be either the result or the cause of disorders of the digestive system.

Chronic inflammation of the mucous membrane of the upper respiratory tract is so frequently found in connection with various forms of dyspepsia as to justify the belief that the latter cause the former, and this view is supported by the fact that general treatment alone will often cure the local symptoms. If the dyspepsia is associated with too liberal a diet or alcoholic tendencies in a plethoric individual, the inferior turbinates are often found to be turgescent and the mucous membrane covering them intensely injected; the lateral bands of the pharynx are red and swollen, and the soft palate is congested, while similar changes may occur in the larynx. The patients are very intolerant of local examination. The secretions may be muco-purulent,

abundant, and tenacious, or they may be scanty with a tendency to dry in the form of grey crusts on the mucous membrane. If the form of dyspepsia is such as to produce a glazed, red, and irritable tongue, a similar condition can generally be found in the nose, pharynx, and larynx ; the turbinates though full are red and shiny, the mucous membrane of the naso-pharynx and posterior wall of the pharynx looks thin, red, and glazed, and a similar condition may extend to the larynx. Again, ordinary granular pharyngitis accompanied by a sensation of extreme dryness in the throat is frequently found in connection with flatulent dyspepsia associated with a dirty coated tongue ; and a pale, boggy enlargement of the inferior turbinates accompanied by a profuse muco-purulent discharge often complicates the dyspepsia and constipation associated with anaemia. Lastly, hyperæsthesia and more especially paraesthesia of the pharynx are more frequently due to disorders of the digestion than to any other cause.

On the other hand, digestive disorders may be the direct result of diseases of the upper respiratory tract. In children, for instance, stomachic disorders and loss of appetite are often due to swallowing the abundant muco-purulent discharge associated with adenoids ; in adults, dyspepsia often results from swallowing the discharge coming from a suppurating sinus or from some ulcerated surface ; or persistent indigestion may be secondary to atrophic rhinitis with ozoena.

Liver.—In cirrhosis of the liver haemorrhages from the congested mucous membranes are not uncommon. Epistaxis is the commonest form, but occasionally small ecchymoses occur in the larynx (see Epistaxis, p. 375).

Diseases of the Blood and Lymph Systems.—(1) **In Anæmia** there is general pallor of the mucous membranes of the upper respiratory passages. In the nose it is particularly marked and occurs early ; indeed the pallor due to anæmia may often be seen here before any change can be noticed in the conjunctivæ, lips, gums, or elsewhere. The mucous membrane is very white and generally collapsed, allowing the shape of the turbinated bones themselves to be seen, though if anæmia occurs in a person previously suffering from chronic rhinitis, the inferior turbinals are usually swollen and sodden, as well as pale. If the anæmia is secondary to severe haemorrhage or starvation, olfactory hallucinations are often present.

In the pharynx, in addition to the general pallor, there is often some sensory disorder ; the mucous membrane may be either hyperaesthetic or anaesthetic, and paraesthesia is not uncommon. The chief laryngeal symptom is some alteration of the voice : it may be merely weak or husky, or there may be complete functional aphonia. It must be remembered that localised areas of anaemia in the upper respiratory tract are very common in pulmonary phthisis. Such patches are most frequently seen on the soft palate and epiglottis (p. 99). In exaggerated cases of simple anaemia and more especially in pernicious anaemia small ecchymoses or slight haemorrhage may occur.

(2) **In Leukæmia**, especially in the acute lymphatic type of the disease, the fauces and tonsils may become greatly swollen and of a dull bronze-red colour with a tendency to rapid necrotic disintegration, which is often associated with gangrenous stomatitis. Severe epistaxis, which is difficult to arrest, is also common.

(3) **Hæmorrhagic Diathesis**.—In hæmophilia, purpura, and scorbutus, haemorrhages frequently occur, epistaxis being especially common and troublesome. Submucous ecchymoses may also occur.

(4) **Lymphadenoma**.—In slight cases there is a waxy appearance and general yellowish pallor of the mucous membrane, with a tendency to epistaxis and other haemorrhages. In severer cases lymphoid nodules or more extensive lymphomatous infiltrations, with secondary ulceration and necrosis, may occur in the mucous membrane of the pharynx and larynx. The nodules are most often seen on the tonsils, epiglottis and ary-epiglottic folds, and sometimes in other parts of the larynx and trachea. They are small, whitish, slightly raised and rounded swellings of a soft consistency with a tendency to break down and ulcerate. Extensive uniform infiltrations and occasionally large and definite tumours occur in the tonsils (p. 164), and sometimes in other parts of the pharynx or in the base of the tongue. The glands of the neck and usually those in other parts of the body are enlarged, and if the mediastinal glands are affected there may be paralysis of the cords and symptoms of pressure on the trachea or bronchi.

Rachitis undoubtedly is a strong predisposing cause of laryngismus stridulus, and, whilst there is usually some exciting cause to be found and removed, the tendency to attacks on slight provocation will not be lost until the rachitis has been successfully treated (Chap. xxiv.).

Acromegaly.—Various changes have been noted in acromegaly. The whole osseous framework of the nose may become enlarged, and the mucous membrane may undergo considerable hyperplasia. There is also hyperplasia of the submucous tissues of the soft palate and walls of the pharynx, whilst the larynx often becomes enlarged and the mucous membrane thickened, which changes deepen and roughen the voice.

In **Diabetes Mellitus** the mucous membrane of the pharynx and sometimes of the larynx becomes dry, shiny, and very red. In the later stages aphthous stomatitis and pharyngitis are not uncommon.

Gout.—The upper respiratory tract may be implicated before or during an acute attack of gout, and various changes may also be associated with the gouty diathesis. Before an attack acute pharyngitis and sometimes acute laryngitis may occur, characterised by extreme painfulness and great difficulty in swallowing. The inflammation generally disappears with the appearance of articular symptoms, but may reappear when these pass off. The mucous membrane is generally dry, glazed, and intensely injected, but not uniformly so. The uvula may be principally attacked, and may become excessively oedematous.

In people of a gouty diathesis the ordinary forms of chronic inflammation of the mucous membranes are especially likely to arise with repeated acute exacerbation on slight exposure to cold or damp, or after indiscretions in eating or drinking. But in addition to this there are various forms of rhinitis, pharyngitis, and laryngitis which are specially associated with gout. *In the nose*, for instance, rhinitis sicca associated with plethora (p. 298) is very common. *In the pharynx* either of two conditions may occur : in the first the whole pharynx looks fat, sodden, and swollen ; the uvula is enlarged, pendulous, and flabby, and is thrown into wrinkles on being elevated ; the mucous membrane is dark red or almost blue in colour ; there is an excess of thick, tenacious, mucous secretion ; the parts are very irritable, and retching is easily induced. In the second, the brunt of the inflammation falls on the lateral walls of the pharynx, the other parts being practically normal. The lateral bands are red, swollen, and painful ; the pain is out of all proportion to the objective changes, and often shoots up to the ears, causing great distress, especially on swallowing. Tophi have been seen in the mucous membrane. *In the larynx*, chronic inflammation, characterised by redness,

thickening, and dryness of the mucous membrane, with recurrent attacks of acute laryngitis, is frequently seen. The edges of the cords, the ventricular bands and the inter-arytenoid space are usually affected. Gouty deposits have been observed about the vocal cords and in the crico-arytenoid joints. Possibly some instances of ankylosis of these joints are due to this cause. Mackenzie reports a case of ulceration of the left ventricular band, simulating malignant disease, which proved to be gouty in origin.

Treatment.—The local conditions must be treated according to the suggestions detailed under chronic dry rhinitis (p. 300), chronic pharyngitis (p. 460), and chronic laryngitis (p. 529), but it is of the first importance that the patient's general health should receive due attention. Regulation of the bowels, and the internal administration of colchicum combined with alkalies often improve the general health and relieve the pain in the throat, and the proper regulation of the patient's diet and habits of life are of the greatest moment.

Rheumatism.—The connection between acute inflammation of the tonsils and acute arthritis is discussed under diseases of the tonsils (p. 429); but apart from these affections painful chronic pharyngitis and laryngitis may occur in people predisposed to or suffering from chronic muscular rheumatism, or stiffness of the joints. All forms of "rheumatic pharyngitis" are characterised by pain of a neuralgic type generally radiating down the neck to the collar-bone. The most common conditions are: general pharyngitis accompanied by great local irritability; tonsillitis generally bilateral, the tonsils being red and shiny; and inflammation and swelling of the lateral bands of the pharynx. Acute exacerbations are extremely likely to occur on small provocation. The temporo-maxillary joint is often simultaneously stiff and painful, sometimes limiting the movements of the jaw. Finally, pharyngeal ulcerations have been reported as occurring in connection with rheumatism. Ordinary chronic laryngitis may also occur in rheumatic subjects, whilst in acute rheumatism the crico-arytenoid joint may be involved, leading to fixation of the cord, and very rarely true paralysis of the cords may occur as a sequel to rheumatic fever.

In the treatment of all these conditions the underlying cause should always be attended to, and the local measures recommended for chronic pharyngitis and laryngitis should be carried out (Chapters xix. and xxiii.).

Disease of the Kidneys.—Epistaxis is of fairly frequent

occurrence in chronic interstitial nephritis, and may be very severe and difficult to arrest (p. 378). Small haemorrhages may also occur from the pharynx and larynx. Edema is said to occur in acute nephritis and in chronic parenchymatous nephritis. It affects the soft palate and uvula, and those parts of the larynx where the mucous membrane is loosely attached. Laryngeal oedema must always be a very grave complication of kidney disease. It is described as a greyish-white semi-translucent swelling, commencing in the epiglottis and aryteno-epiglottic bands and gradually spreading to the inter-arytenoid fold and the ventricular bands. It is devoid of all signs of inflammation, but often increases in size as well as in extent with very great rapidity, and has little tendency to decrease spontaneously. The onset of the oedema is marked by some slight discomfort in the larynx, followed by commencing dyspnoea and muffling of the voice. The dyspnoea tends to increase, sometimes so quickly that it may become dangerous in from six to thirty-six hours.

Treatment.—In addition to energetic treatment of the underlying cause, measures must be taken to relieve the local condition. They consist in putting the patient to bed in a warm room, keeping him at absolute rest, and in administering a free purge, such as five grains of calomel, if not otherwise contra-indicated, followed by a diaphoretic mixture. In some cases moist heat will be found to be beneficial, and is best applied by keeping the room surcharged with moisture by means of steam kettles, whilst in other cases the application of cold by means of constantly sucking ice will prove of greater benefit. The effect of whichever method is first tried should be carefully watched, and the other at once substituted if the oedema seems to increase. Directly the dyspnoea becomes at all marked scarification should be promptly and freely performed, and repeated if necessary (p. 497). If this fails to arrest the increasing oedema and the dyspnoea is becoming alarming, tracheotomy should be performed.

Diseases of the Skin.—Various rashes which occur on the true skin have their counterpart on the mucous membranes of the pharynx and larynx. At first their appearances are fairly typical, but owing to the warmth and moisture of the parts there is a great tendency to rapid loss of epithelium and the formation of superficial ulcers. Amongst the commonest of the rashes which occur on the mucous membrane may be mentioned herpes, urticaria, and pemphigus, whilst impetigo and lichen may occur.

Herpes may be coincident with the same disease on the lips or face, but more often occurs alone. Its commencement may be marked by a rise of temperature and a feeling of general malaise. It is most commonly seen in the pharynx, especially on the soft palate, but it sometimes involves the upper part of the larynx. At first small vesicles may be seen, but very shortly there is loss of the epithelium resulting in small, round, and well-defined but quite superficial ulcers with a greyish-white base. Several such ulcers may coalesce and be mistaken for a syphilitic lesion. Sometimes the surface of the ulcer is covered by a thin membrane suggesting diphtheria, but it is loosely attached, and when it separates spontaneously leaves an absolutely sound mucous membrane. As in other parts of the body, herpes of the pharynx is attended and often preceded by very acute pain of a neuralgic type, and is accompanied by a great deal of dysphagia. When the larynx is affected similar changes may be noticed. The vesicles are generally confined to the epiglottis, though they are sometimes seen on the arytenoids and ventricular bands.

The etiology of the affection is doubtful, but it is generally met with in people who are out of health from worry, overwork, or other causes. Exposure to cold seems to be a determining factor in some cases.

Treatment.—If the attack is ushered in by fever, the patient should be kept in bed and given a morning dose of white mixture (p. 59), and a grain of quinine three times a day. When the temperature is normal, general tonics, such as strychnine and iron, a liberal diet, and stimulants in the shape of port wine or Burgundy, are indicated. Locally, the pain may be relieved by insufflations of bismuth and morphia (p. 33), or a spray of menthol (5 per cent. in olive oil). If the dysphagia is very severe, the pharynx may be sprayed with a 10 per cent. solution of cocaine ten minutes before meals. Chlorate of potash and borax are useful gargles (p. 56).

Urticaria.—This seldom affects the mucous membrane alone, but the pharynx and larynx may be involved, and occasionally before the cutaneous eruption appears. The chief changes are redness, swelling, and oedema, the latter being by far the most serious of the pathological changes. It occurs chiefly in the uvula, epiglottis, and aryteno-epiglottic folds. In mild cases the symptoms are irritation in the throat with cough, but in severe cases dyspnoea is superadded. Its onset is sudden, and it may rapidly assume dangerous proportions and even cause death from asphyxia.

The treatment is the same as for urticaria generally, but should dangerous dyspnoea supervene the oedema must be treated on the lines suggested for acute oedema occurring in septic laryngitis (p. 497).

Angio-Neurotic Oedema.—In this disease, which is characterised by the sudden appearance of circumscribed patches of oedema in different parts of the surface of the body and in the mucous membranes, the pharynx and larynx may be affected. The patches, after lasting one or two days, subside as rapidly as they appeared. In the pharynx they are not serious, but occasionally in the larynx they may prove rapidly and almost suddenly fatal from asphyxiation. If time permits this condition must be treated on the same lines as are recommended for passive oedema complicating renal disease (p. 181).

Pemphigus.—This may attack the pharynx and rarely the larynx, with or without a similar condition of the skin. It occurs in periodic attacks, accompanied by considerable pain and great discomfort. At the commencement a few clear transparent blebs form, the contents of which in the course of an hour or two become first turbid and then yellow, and finally the blebs burst, and, after discharging their yellow fluid, collapse. The white epithelium composing its walls then lies in folds on the surface of the mucous membrane, looking like a false membrane and at first sight suggesting the probability of diphtheria. There is no marked surrounding inflammation, and when healing is complete there are no traces of scars.

Treatment.—The symptoms of the immediate attack can be relieved, but it is extremely difficult to prevent the periodic recurrence of the affection. Relief may be obtained by the use of an alkaline wash followed by menthol spray, or, if the pain is severe, by orthoform insufflations. To prevent further attacks, attention to the general health and habits of the patient is most important. A thorough change of air, regulation of diet, and the administration of tonics are indicated. Arsenic should always be tried in increasing doses, combined with bitter tonics (p. 60) or with ammonio-citrate of iron (p. 110), as indicated in the particular case. The digestion, if faulty, should always be first treated.

Impetigo, Lichen, Erythema, and some other skin diseases have in very rare instances been met with in the pharynx, but are not of common occurrence.

Disturbances of the Sexual Functions.—Certain phenomena occur in the mucous membrane of the upper respiratory tract in

connection with various disorders of the sexual functions. They consist chiefly of vascular changes, and are seen as hyperæmia, swelling, exudations, and haemorrhages; they are probably caused through the influence of the vaso-motor system. These changes are seen chiefly in the inferior turbinated bodies, as is natural considering their free and peculiar vascular supply. The symptoms complained of are periodic obstruction of one or both nostrils or more frequently alternating from one nostril to the other, excessive secretions, and epistaxis. The haemorrhage may come from either the inferior turbinates or the lower part of the septum, and is often preceded by headache. Such symptoms occur in connection with dysmenorrhœa, and sometimes accompany or precede normal menstruation. In cases of amenorrhœa, or after the menopause, they may occur every month at the regular menstrual intervals. They are also associated with excessive sexual excitement in the male.

The pharynx and larynx may also become hyperæmic in the course of sexual irregularities. Female singers often complain of slight hoarseness and tiring of the voice during the menstrual period, and hyperæmia of the larynx is common in the male at puberty. Sensory disturbances such as hyperæsthesia and paraesthesia are also of common occurrence in sexual disorders.

Changes in the Upper Respiratory Tract at Puberty.—Both in male and female there is at about the time of puberty a rapid development of the parts composing the upper respiratory tract out of proportion to the development of the body generally, and more marked in the male than the female. In itself this is perfectly normal, but it is liable to exercise a certain influence on pathological processes. As already pointed out, changes occurring in the sexual organs are often accompanied by congestion of the mucous membranes, which render them susceptible to inflammatory processes, and thus catarrh of the nose, pharynx, and larynx are common at puberty. The accessory sinuses of the nose share in this development, and after puberty become liable to diseased conditions, which are excessively rare before puberty. Many symptoms produced by the presence of adenoid hyperplasia in the post-nasal space disappear, as, owing to the enlargement of the space, the growth no longer produces obstruction. In the larynx the most important symptoms occur in connection with the lengthening of the vocal cords and the consequent change of voice. In the female this lengthening is not very marked, and consequently

the changes in the voice are but slight, being simply the change from a child's to a woman's voice. Occasionally it becomes for a time very rough and unsteady. In the male, on the other hand, considerable lengthening occurs, which results in the marked change from the boyish treble to the timbre of manhood. Under normal circumstances this should be a gradual and even descent, but if the voice is used or catarrhal conditions are contracted, it is likely to break, crack, and squeak, and to become hoarse, uneven, and very unpleasant. The muscles are extremely liable to fatigue, not having adapted themselves to the new conditions, and any excessive use of the voice is sure to be followed by these unpleasant symptoms; moreover, the mucous membranes, normally hyperæmic at this period, are extremely prone to catarrhal inflammation, which will be followed by the same results. In the majority of cases the voice settles down eventually, but the cracking may last from a few months to two or three years. In a few instances, however, the voice becomes falsetto and may remain so for many years and perhaps permanently. This is frequently seen in choir boys who continue to sing after the voice has commenced to change. In all these abnormalities examination with the laryngoscope will reveal chronic laryngitis or pareses of the adductors or tensors or both.

The treatment consists in rest of the voice, slightly stimulating inhalations, and attention to any catarrhal condition or injurious abnormality in the nose or naso-pharynx. The persistent falsetto voice must be treated by means of vocal and respiratory gymnastics. Fournier recommends that for the first few days the patient should be taught to make deep and slow inspirations and expirations, and during the latter to phonate in as deep a tone as possible. This should be repeated several times daily. Later the patient should be made to pronounce words slowly and deeply, making them longer and longer until finally he should commence reading aloud. He states that in about a fortnight the voice will assume a low tone, usually bass or baritone, and will remain so.

Diseases of the Nervous System.—In diseases of the nervous system various sensory and motor changes may occur in the pharynx and larynx, which are often of diagnostic value in determining the nature of the nervous lesion.

(1) In *Tabes Dorsalis* laryngeal paralysis, crises, ataxic movements, and sensory disturbances may occur.

Paralysis is by far the commonest of these complications. The abductor muscles are always first attacked, and probably in the first instance on one side only. As the disease advances, however, the abductor paralysis usually becomes bilateral and later still the tensors may be involved; but it is the exception in tabes for complete recurrent paralysis to be found. The laryngeal paralysis may precede any other sign of tabes by many months and even one, two, or three years; but if the paralysis is accompanied by a persistently increased pulse-rate tabes should always be suspected (Watson Williams).

Laryngeal Crises may occur independently of abductor paralysis, but more often in conjunction with it. The attack is characterised by a fit of coughing followed by dyspnoea. There is first a sensation of tickling or burning in the throat, which is quickly followed by a choking attack. Inspiration is loud and strident, and expiration is accompanied by a series of violent barking coughs. The patient becomes much excited and has a sense of impending suffocation, and finally respiration ceases. Occasionally there is loss of consciousness, or vertigo and vomiting. After from thirty seconds to a minute respiration recommences, and in a few minutes the patient is as a rule himself again. Very rarely, however, the attack may terminate fatally.

Ataxic Movements of the cords occasionally arise, due to a want of proper co-ordination between the opposing sets of muscles. The speech becomes jerky in consequence, and sometimes the voice is momentarily lost in the act of speaking.

Sensory Disturbances are rare in tabes, but laryngeal anaesthesia and hyperesthesia are occasionally found. If paresthesia occurs there is generally a sensation of constriction in the throat. There may be similar sensory disturbances in the pharynx.

(2) In **Disseminated Sclerosis** muscular paralyses are very rare, only one case of abductor paralysis being reported (Riegel). Various motor phenomena are, however, fairly common, such as retardation and hesitation of muscular movements and intention tremors, that is, tremors occurring only during phonatory efforts. As a result the voice shows an abnormal tendency to become fatigued, and the speech to be hesitating and interrupted by explosive squeaks. Again, adduction and tension of the cords may be incomplete, causing a rough, deep, and hoarse tone of the voice.

(3) In **Syringo-myelia** complete recurrent paralysis, generally unilateral but occasionally bilateral, may occur, and in rare instances

abductor paralysis has been seen alone. Paralysis and atrophy of the trapezius often accompany the laryngeal changes, and sometimes similar affections of the palate and pharynx are found.

(4) In **Progressive Amyotrophic Bulbar Paralysis** the palatal and pharyngeal muscles are early affected, and later the laryngeal muscles become wasted and consequently the voice feeble. Occasionally abductor or complete recurrent paralysis of the vocal cords may occur. There is no anaesthesia, but the reflexes of the palate, pharynx, and larynx are lost, which may lead to the entrance of food into the larynx and so to attacks of suffocation and possibly to broncho-pneumonia.

(5) In **General Paralysis** laryngeal spasm is sometimes an early sign, and Permewan has pointed out that more or less paresis of the abductors is far from uncommon.

(6) In **Paralysis Agitans** twitching movements of the vocal cords occur fairly regularly both during phonation and respiration, and the epiglottis and uvula may also be involved. These movements of the vocal cords cause the voice to undergo sudden changes from a high to a low register, and the speech becomes jerky, interrupted, and tremulous.

(7) In **Hysteria**, sensory and motor disturbances and disturbances of the special senses are met with. The usual *sensory phenomena* are anaesthesia, paraesthesia, and analgesia. Anaesthesia occurs most commonly in the pharynx, and is comparatively rare in the nose and larynx. Schnitzler has observed cases of anaesthesia of the pharynx and of the posterior wall of the larynx accompanied by pain in the throat (anaesthesia dolorosa). Paraesthesia takes the form of the sensation of a foreign body or tickling, which in the nose leads to sneezing, and in the pharynx and larynx to coughing, hawking, straining, and even vomiting, or to a constant desire to swallow. Analgesia of the mucous membranes occurs in connection with analgesia of the surface of the body.

Motor Phenomena are fairly common in the larynx, but rare in the pharynx. In the pharynx paralysis of the palate is occasionally found, and the "globus hystericus" is probably due to a spasmodic contraction of the pharyngeal muscles (p. 474). Instances of rhythmic contractions of the velum and posterior pillars of the fauces, sometimes accompanied by similar movements of the laryngeal adductor muscles, have been met with as reflex phenomena in hysterical or neurotic subjects (p. 472), though more often such movements are symptoms of some organic lesion of the central

nervous system. In the larynx various paralyses of hysterical origin are common, any of the voluntary muscles being attacked either singly or in groups. Thus unilateral or bilateral adductor paralysis, paralysis of the internal tensors, or of the arytenoideus are all commonly seen. These forms of paralysis and the accompanying functional aphonia are fully dealt with in Chapter xxiv.

It is doubtful whether functional paralysis of the abductors ever occurs. Cases have been reported, but it seems probable that the phenomena are due in some instances to the cords being drawn inwards during inspiration and separated during expiration, a condition described by Semon as "perverted action" of the cords; in other instances limitation or abolition of abduction may occur after a severe attack of acute laryngitis, when it is probably the result of inflammatory changes and the consequent desire for physiological rest. Lastly, in yet other instances apparent functional abductor paralysis may possibly be due to a persistent adductor spasm of hysterical origin. In these functional derangements the abolition of abduction is not constant, and if the examination be repeated once or twice full abduction will be seen to occur every now and then; or, as pointed out by Semon, if the patient is rendered breathless by saying "ee" many times in one breath, normal abduction will take place during the succeeding inspiration.

Spastic phenomena are occasionally hysterical in origin, and are often accompanied by strange noises, such as bleating, howling, grunting, or a spasmodic cry. It is difficult to say how far nervous cough, phonic spasm, &c., described in Chapter xxiv., should be considered to be of purely hysterical origin.

Disturbances of special sense are exemplified in the nose by anosmia and parosmia, and are often accompanied by loss or perversion of the sense of taste.

SECTION III

DISEASES OF THE NOSE

CHAPTER VIII

ACUTE INFLAMMATORY AFFECTIONS OF THE NOSE

I. SIMPLE ACUTE RHINITIS. II. ACUTE RHINITIS DUE TO GENERAL INFECTIONS. III. ACUTE RHINITIS DUE TO LOCAL INFECTIONS : A. *Purulent Rhinitis*.—B. *Membranous Rhinitis*. IV. ACUTE RHINITIS DUE TO THE INTERNAL ADMINISTRATION OF DRUGS. V. ACUTE RHINITIS DUE TO LOCAL IRRITANTS.

ACUTE inflammatory affections may be due to several distinct pathological processes, and may be met with in various forms. For clearness of description the following classification will, therefore, be adopted :—

- I. Simple acute rhinitis or acute nasal catarrh.
- II. Acute rhinitis accompanying general infections. (See Sect. II. Chap. iv.)
- III. Acute rhinitis due to local infections.
- IV. Acute rhinitis due to the internal administration of drugs.
- V. Acute rhinitis due to local irritants.

I. SIMPLE ACUTE RHINITIS

Simple acute rhinitis, or “cold in the head,” is perhaps the commonest of all acute diseases, and, though a trivial ailment in itself, may result in more serious troubles if neglected.

Etiology.—The causes of a cold are both predisposing and exciting. Amongst the former, heredity, constitutional conditions, insanitary surroundings, age, and the existence of chronic nasal catarrh, are the most important. As regards *Heredity* the fact that some families are especially prone to acute and chronic catarrhs suggests that there may be some hereditary condition which causes a peculiar susceptibility to “catching cold.” The *Constitutional Conditions* which predispose to catarrh are especially the gouty and rheumatic; but children of parents with a tuberculous history, and adults with dyspeptic or alcoholic

tendencies, are also very liable to acute catarrh. Any *Insanitary Conditions* which lead to the deterioration of the general health are certainly predisposing causes. Bad air, insufficient food, defective sanitation, sedentary habits, and low-lying and damp situations may be especially mentioned. As regards *Age* children are the most susceptible to colds, the susceptibility diminishing as age advances. The existence of *Chronic Nasal Catarrh* is perhaps the most constant and important of all predisposing causes, for where a chronic inflammatory condition exists it requires but a feeble exciting cause to induce an acute inflammatory process. Adenoids, or any nasal abnormalities which tend to cause or aggravate a chronic catarrh, must therefore be looked upon as predisposing causes of acute conditions.

Of the exciting causes exposure to cold, exposure to heat, and infection must be mentioned. *Exposure to cold* is the commonest exciting cause. Acute catarrhs are most frequent in autumn and spring, that is, when there is a mean but variable temperature, when the humidity of the atmosphere is great, and when the winds are strong and variable. A slight exposure under these conditions is more liable to be followed by acute catarrh than a prolonged exposure when the air is cold, dry, and still. Apart from these atmospheric conditions catarrhs may be induced in the following ways; exposure to draughts, slight exposure whilst perspiring, sudden and extreme changes of temperature, the use of insufficient or wrongly selected clothing, wearing thin or tight boots, and wet feet. *Exposure to heat*, though it is not so generally recognised, is also a frequent source of catarrhs. Acute rhinitis has been known to follow prolonged exposure to the sun's rays, but this is rare and probably not directly due to heat. It is the heat of over-warmed and ill-ventilated rooms, such as lecture-halls, churches, and theatres, which is so productive of catarrh. It does not seem to be due to the exposure on coming out of such places, for some sensitive persons will start the initial stages of a cold whilst still in an over-heated place. *Infection*.—Though no specific micro-organism has yet been found in connection with common catarrh, there are many things to suggest that acute rhinitis is infectious. To mention one fact only, namely, the way in which "colds" will run through a house or business establishment, each person sickening at a few days' interval, is most suggestive. Should its infectious nature be established, then exposure to cold must be looked upon as only a predisposing cause, acting by

lowering the resisting power, and the contraction of colds in over-crowded, over-heated, and ill-ventilated places can be accounted for by such conditions favouring the spread of any infectious disease.

Pathological Changes.—Both pathologically and clinically three very definite and distinct stages can be recognised.

(a) *The initial stage* is characterised by intense injection of the mucous membrane, which at the same time becomes dry, shiny, and swollen.

(b) *The second stage* is marked by a further swelling of the mucous membrane accompanied by hypersecretion. The nasal passages become quite blocked by tumefaction of the turbinates and the mucous membrane generally, from which a copious, thin, watery discharge of an intensely irritating character is poured out.

(c) *In the third stage* the injection and swelling of the mucous membrane begin to subside, and the discharge becomes muco-purulent, non-irritating, thick, and often difficult to blow from the nose. Later, both injection and swelling disappear and the secretions gradually become healthy, though for a time they remain rather free. Occasionally, and especially if a cold is neglected, the third stage is much prolonged, and may pass into a condition of chronic catarrh.

The Symptoms are too well known to require mentioning in detail. A cold is generally ushered in by a feeling of irritation in, or by a sense of fulness over, the nose, but sometimes the first symptom is a smarting or sensation of roughness in the post-nasal space, pharynx, or even larynx, the nasal symptoms following in the course of a few hours or occasionally a day or so. The pharynx or larynx may be the chief seat of trouble, in which case the illness is spoken of as acute pharyngitis or acute laryngitis respectively (pp. 415 and 484), and even when a "cold" starts in the head these lower regions are nearly always affected to a greater or less extent during its course.

Complications and Sequelæ.—A common cold will usually run its course, get well, and leave no trace behind it, especially if ordinary care be taken. If, however, a cold be neglected or if it is influenzal in origin, various complications may occur, of which the following are the most important: inflammation and suppuration of any of the sinuses, catarrh of the Eustachian tubes, acute otitis media, often going on to suppuration and sometimes causing mastoiditis with its attendant dangers, chronic rhinitis, rarefying

osteitis with the formation of polypi, acute and chronic pharyngitis, laryngitis, tracheitis, and occasionally bronchitis.

Treatment.—Both general and local treatment will vary according to the stage of the cold.

Initial Stage.—(a) *General.*—The chief indication at this stage is to abort the attack, which is undoubtedly possible if the patient will submit to treatment. The measures adopted must vary with the patient's ability and willingness to stay in bed. If he can do so, the following is the best method of procedure: a hot-air bath is at once administered by means of one of the portable apparatus now on the market, or by the simple device of seating the patient on a wooden chair beneath which a small spirit lamp is placed, and enveloping both patient and chair in a large blanket. The bath should be continued until a profuse perspiration is well established, which generally takes from fifteen to twenty-five minutes. The patient is then wrapped in a warm blanket, put straight to bed, and at once given some form of hot drink, such as black-currant tea, linseed tea, or hot whisky and water, with the object of keeping up the perspiration started by the air bath. Five grains of calomel should be given at night, followed by a dose of Mist. Alb. (p. 59) in the morning. If the bath be impossible or contra-indicated, the patient should be put to bed in a warm room (about 62° F. = 16.7° C.) and either a single 10-grain dose of Dover's powder or the following mixture should be administered every six hours:—

R.	Tincture of opium	5 m. to 10 = 0.31 to 0.62 c.c.
	Spirit of nitrous ether	20 m. = 1.25 c.c.
	Solution of acetate of ammonium	2 dr. = 7.5 c.c.
	Camphor water	to 1 oz. = 30 c.c.

The patient must remain in bed twenty-four to forty-eight hours, and in the house another day. The above method will often stop a cold without further treatment.

If the patient will not retire to bed, but can stay in the house, decoction of cinnamon in the form of tabloids may be given in the following way: two tabloids of 5 grains each every half-hour at the very commencement of the cold for two hours, then two tabloids every three hours for twelve hours, and finally one every four hours until all traces of a cold have disappeared. If the cinnamon is left off too soon catarrhal symptoms will re-appear. Thus given, cinnamon will in some people abort a cold in the

course of twenty-four hours, especially when the symptoms are chiefly nasal. As alternatives Tr. Opii (5 to 10 minims) may be given three times in the day on an empty stomach and is often attended with good results (Mackenzie), or a single big dose of quinine (10 grs.) may be tried. Spirit of camphor, 10 drops on sugar, at the onset of a cold, has a household renown, and sometimes acts well. Aconite has also been very strongly recommended as an abortive, given in the form of the tincture in 1-minim doses every hour until its physiological effects begin to show themselves. It is, however, very uncertain and unsafe, and therefore should not be used unless its action can be closely watched.

If the patient cannot even remain in the house there is little chance of aborting the cold; but cinnamon tabloids or the single big dose of quinine may be tried, and are better than opiates if the patient is going out. In America the following tablet is largely used for patients who cannot stay indoors—

R.	Extract of belladonna	.	.	.	.	.	$\frac{1}{8}$ gr. = 0.008 gm.
	Camphor	.	.	.	.	.	$\frac{1}{4}$ gr. = 0.016 gm.
	Sulphate of quinine	.	.	.	.	.	$\frac{1}{4}$ gr. = 0.016 gm.

It should be given at first every two hours until dryness of the throat occurs, and then continued every four hours.

The diet should be unirritating and semi-solid, especially if the pharynx or larynx is much affected. Mineral waters, such as Seltzer, are supposed to be beneficial and are much used in Germany. Mackenzie suggests that the alkaline mineral water exercises a solvent action upon mucous accumulations.

(b) *Local.*—Local measures are not, as a rule, of much assistance from the curative standpoint, though occasionally the use of the alkaline (p. 29) or compound menthol nasal wash (p. 48) directly the local irritation is felt, seems to check the catarrh. Local applications, however, give some relief to the symptoms. The bismuth and morphia (p. 33) and the iodol and menthol (p. 42) insufflations, used as snuff every hour or so, are beneficial, or frequently spraying the nostrils with the Nebula Menthol (p. 44) will give relief. "Anticatarrhal" smelling salts have lately obtained much popularity amongst the laity. They nearly all contain carbolic acid and ammonia and undoubtedly relieve the sensation of stuffiness and fulness in the head, but it is doubtful whether they do any real good. They are irritating to the

nasal mucous membrane and, if used to excess, they are liable to increase the inflammation. The following is a good example of such remedies :—

R.	Liquid carbolic acid	1 dr. = 3.55 c.c.
	Carbonate of ammonium	2 dr. = 7.77 gm.
	Powdered wood charcoal	2 dr. = 7.77 gm.
	Compound tincture of benzoin	1 dr. = 3.55 gm.
	Oil of lavender	6 m. = 0.35 c.c.
	Strong solution of ammonia	3 dr. = 10.65 c.c.

Treatment of the Second Stage.—(a) *General.*—If a cold has existed more than twenty-four hours it is useless to try and abort it, yet much may be done to shorten its course and to render the patient more comfortable. If for any reason it is important for the patient to get well quickly, he should be confined to one room, or at all events to the house. Five grains of blue pill or calomel should be given at bedtime, followed by a dose of *Mistura Alba* (p. 59) in the morning. No drugs seem to be specially valuable in acting directly on the local process in this stage, but tonics are indicated, and especially quinine (one grain three times a day after food).

If the tongue is foul and the digestion upset, the *Mistura Rhei Ammoniata* (p. 60) should be given before tonics are commenced.

(b) *Local.*—In this stage local remedies are very important, for they not only render the patient more comfortable, but tend to shorten the attack. There are a great many applications which can be recommended, but the following is a good routine treatment :—

The nose is first sprayed with *Nebula Menthol cum Cocaina* (p. 44) which not only in itself has a beneficial action, but, by reducing the tumefaction of the mucous membrane, renders it possible to apply other remedies. The next step is to cleanse the nose thoroughly with *Collunarium Benzoini* (p. 48) used from the palm of the hand or gently syringed up the nostrils. Finally an inhalation of *Vapor Tincturae Benzoini* (p. 52) should be breathed through the nose according to the directions given on p. 51, or two drachms of spirits of camphor may be added to a pint of nearly boiling water and the steam inhaled. These various applications should be repeated every three or four hours. Additional relief to the symptoms may be also given by the frequent introduction of small pieces of lanolin within the nostrils.

If the patient will not remain in the house, but wishes to go about his ordinary business, he should use Coll. Benzoini night and morning, and he will also find it very comforting to carry about one of Cushmann's dry menthol inhalers and use it frequently.

In this stage of a cold Bosworth recommends the application of a 5 per cent. solution of cocaine. He says that in this drug we have a definite and absolute remedy for controlling the venous congestion. He denies that there is any reaction after its use, but affirms that the blood-vessels do not return to their original highly distended condition, so that if in acute rhinitis we repeat the application of cocaine as soon as the patient experiences any sensation of recurring stenosis, we may eventually curtail the duration of the attack and keep it under control if we do not completely arrest it. It is quite certain that its frequent use would render the patient very comfortable and do much to shorten the attack subjectively, but it cannot be looked upon as a curative agent, and, being a strong solution of cocaine, it is hardly right or safe to place it indiscriminately into the hands of every patient. The malady for which it is given is comparatively trivial, and on the other hand the contraction of a cocaine habit is a most serious evil.

Treatment of the Third Stage.—(a) *General*.—Quinine or arsenic (p. 60) or cod-liver oil with iodide of iron are useful tonics. In obstinate cases large doses of perchloride of iron seem to act very beneficially in clearing up the discharge. It may be given three times a day in the following manner :—

R.	Solution of hydrochloride of strychnine	5 m. = 0·31 c.c.
	Tincture of perchloride of iron	20 m. = 1·25 c.c.
	Sulphate of sodium	15 gr. = 1·03 gm.
	Glycerin	10 m. = 0·62 c.c.
	Water	to 1 oz. = 30 c.c.

If the patient is much pulled down and seems unable to get rid of the discharge, change of air should be strongly recommended.

(b) *Local*.—In this stage the objects to be kept in view are the arrest of the muco-purulent discharge, and the reduction of the turbinates to their normal size. With the first object in view the nose should be thoroughly washed out night and morning and at least once in the middle of the day with a slightly astringent solution, such as the Collunarium Hazelin (p. 49), or with simple

detergents, such as Collunarium Alkalimum (p. 29) or Collunarium Phenol Compositum (p. 47). After cleansing with one of these lotions a spray of menthol in paroleine (5 gr. to 1 oz.) should be used. These applications will, as a rule, clear up the discharge and reduce the turgescence of the mucous membrane.

Sometimes the inferior turbinates remain enlarged, and the discharge excessive for many weeks after the acute inflammation has subsided, under which circumstances it is advisable to cauterise the turbinates with chromic acid or the electric cautery. Of the two chromic acid is to be preferred as it seems to produce less inflammatory reaction. The object of cauterisation being to pin the mucous membrane down to the bone in one or two places by means of adhesions, the caustic agent should be so applied as to burn deeply into a limited area, rather than superficially over a large surface. For directions as to the technique of cauterisation, see pp. 32 and 217.

Weak solutions of nitrate of silver, chloride of zinc, and other mineral astringents have been used for this stage of a head cold as local applications, but, as the nasal mucosa is highly intolerant and easily irritated, they are not to be recommended.

In some instances the rhinitis is kept up by the persistence of a muco-purulent discharge from the post-nasal space, which runs forwards and causes irritation. The post-nasal space should under these circumstances be carefully painted with a solution of nitrate of silver (40 to 60 gr. to 1 oz.) according to the directions already given (p. 38).

Preventive Treatment.—In persons peculiarly susceptible to colds, prophylactic measures should be adopted. They consist in careful attention to the general health, in proper regulation of the patient's habits of life, in taking special means to increase the resistance to cold, and in treatment of any chronic catarrhal condition of the upper respiratory passages. The general health must be dealt with on general principles. The gouty or plethoric patient must be carefully dieted, alcohol should be prohibited, and the bowels should be kept freely open by one of the natural mineral waters. The weakly thin patient should be put on a full nourishing diet and take cod-liver oil during the winter months. In both classes of patients regular outdoor exercise and the avoidance of hot, stuffy, ill-ventilated rooms are most necessary. The question of clothing is also important. The great essential is that it should be sufficient without being excessive, and that it should be equally

distributed over the body. Special protectors, either for the chest or abdomen, are useless and better avoided, for it is not usually the exposed part that catches cold. Bosworth correctly points out that more acute catarrhs are contracted through insufficient protection to the feet than in any other way, and yet it is not the feet, but the nasal passages, which suffer from the catarrh. Flannel or wool of medium weight should therefore be worn next the skin, and the boots must be sufficiently large to avoid arrest of the circulation and sufficiently thick to prevent escape of body heat or the entrance of damp. Excessive clothing is to be avoided, because it causes perspiration on the slightest exertion and so renders the patient susceptible to a chill. When walking or taking other exercise, fur boas and wraps ought not to be used, but when driving in an open carriage in cold winds the neck must be protected. After active exercise of any description, by which free perspiration is induced, the clothes ought to be changed at once and the body well rubbed with a rough towel. Women especially require this warning. They have adopted the pastimes of men, but not their habit of "changing" before and after the game.

In this changeable climate it is most necessary to harden the surface of the body so as to render it insusceptible to the variations of temperature. The best method of obtaining this end is the daily use of the cold bath, but it must not be indiscriminately advised to all. If it produces a healthy reaction, it is quite safe and does good. If, on the other hand, it produces no reaction but renders the bather cold and shivery for hours afterwards, it is harmful and likely to render him more susceptible to catarrhs. Such people may be advised to wash in hot water and afterwards to sponge the face, neck, and chest for a minute or two with cold water. Whichever method is adopted it should be followed by energetic friction with a rough towel, which not only helps to restore the surface heat but removes *débris* from the orifices of the sweat glands, thus securing to them the possibility of healthy action.

Resistance to cold may also be increased by keeping the dwelling-house freely ventilated. Halls, passages, sitting-rooms, and bedrooms ought always to have a window open, but care must be taken not to sit in a direct draught, especially when hot. In winter, though open windows are advisable, the temperature of the rooms should be kept up to 60° F. (15.6° C.) by means of

artificial heat, an open fire being by far the healthiest method. Care should also be taken not to have too great a difference between the sitting-room and bedroom.

Lastly, chronic catarrh and other abnormalities of the upper air passages must be carefully attended to. Acute catarrh, if often repeated, almost always causes some chronic catarrh, and chronic catarrh, as already pointed out, vastly increases the susceptibility to acute catarrh. This vicious circle must be broken by getting rid of the chronic condition between the acute attacks.

ACUTE RHINITIS IN INFANTS

Special Features.—A severe nasal catarrh may produce troublesome and even alarming symptoms in infants under the age of eighteen months. In the first place, children do not readily adopt buccal respiration, so that they are liable to severe attacks of difficult breathing at night, which may be mistaken for laryngeal obstruction. A diagnosis can, however, be easily made by waking up the child or even by watching the anterior triangles of the neck. If these recede, the obstruction must be above the larynx and is probably nasal or post-nasal in origin. Secondly, acute rhinitis in infants is extremely likely to spread downwards and give rise to capillary bronchitis, which is often accompanied by extensive collapse of the lung, a serious and often fatal complication. Finally, nasal obstruction may render the infant quite unable to suck the breast or bottle and so lead to wasting.

Treatment.—Bearing in mind the above dangers, a “cold in the head” in infants should always be treated seriously. The child must be confined to bed in a well-ventilated room, the temperature of which is maintained at 66° F. (18.9° C.), and a grey powder should at once be given. In very severe cases it may be advisable to cleanse the nose as thoroughly as may be possible with Collunarium Benzoini (p. 48) diluted with equal parts of warm water. The best method of using it is to place the child on his back on the nurse’s lap with his head hanging over her knees, and drop the lotion into the nose from a piece of cotton wool or a teaspoon. A few drops should thus be introduced at a time and the nose then squeezed from above downwards, the discharges being afterwards wiped away. Should the nasal obstruction interfere with the infant’s sucking, spoon feeding must be adopted. Some surgeons

have practised inserting a small piece of rubber tubing into the inferior meatus to enable the child to breathe, or a roll of blotting paper, which also absorbs the secretions, has been suggested. These methods are not efficacious in bad cases, and may do harm by irritating the already inflamed mucous membrane. Painting the nostrils with a 2 per cent. solution of cocaine has also been practised, but it cannot be recommended, as infants are highly susceptible to the poisonous action of cocaine.

II. ACUTE RHINITIS ACCOMPANYING GENERAL INFECTIONS

The acute inflammatory affections of the nose which may occur in the course of the acute specific fevers have already been described in Chapter iv., to which reference must be made.

III. ACUTE RHINITIS DUE TO LOCAL INFECTION

Under this heading two distinct diseases must be described, namely : 1. Acute Purulent Rhinitis ; 2. Membranous Rhinitis.

1. ACUTE PURULENT RHINITIS

Definition.—This form of rhinitis is characterised by acute inflammation of the nasal mucous membrane accompanied by a free discharge of pus. Although it may be met with in adults, it must be considered as a disease of infancy and especially of the newly born. It is most commonly seen amongst the poorer classes, and is intimately associated with all forms of insanitary conditions. It must be carefully distinguished from the chronic purulent rhinitis of childhood, which will be described in a future chapter (p. 302).

Etiology.—In cases occurring in newly born infants there can be but little doubt that the disease is due to local infection from the vaginal discharges of the mother. As in ophthalmia neonatorum, it is frequently associated with the gonococcus, though doubtless some cases are caused by other pyogenic organisms, such as the staphylococcus aureus or albus or various streptococci. In adults it can nearly always be traced to infection from either vaginal or urethral discharges, though one reported case was apparently due to the introduction of pus from a suppurating ear.

Purulent rhinitis may also occur in the course of many of the acute infectious diseases, such as measles, scarlet fever, diphtheria, smallpox, and glanders.

Pathological Changes.—The chief objective changes are acute inflammation of the mucous membrane, accompanied by great turgescence of the inferior turbinates and a free discharge of pus.

Symptoms.—Acute purulent rhinitis is generally ushered in by severe febrile disturbance, more marked in adults than in children. When fully established, nasal stenosis, the free discharge of pus, excoriation of the edges of the nostrils and upper lip, and occasionally foetor, are the chief symptoms. Both nasal cavities are affected. In children the stenosis may be so great that nasal respiration and sucking become impossible. The eyes, if not already affected at the onset of the disease, are very apt to become so.

Diagnosis.—The most important point in diagnosis is to exclude diphtheria, for undetected cases of nasal diphtheria are a great source of danger to others. In diphtheria the discharge is less profuse, membrane can generally be found both in the nose and fauces, and it is evident that the patient is seriously ill. In some cases of bad faucial diphtheria there may be purulent rhinitis without the formation of membrane in the nasal fossæ, but the faucial appearances and the general condition of the patient will lead to a correct diagnosis.

Purulent rhinitis will also occasionally have to be distinguished from fibrinous rhinitis, from the presence of foreign bodies, and in adults, from purulent disease of the accessory sinuses, and possibly from syphilis or tuberculosis. Careful examination of the nasal fossæ and attention to the pathological changes will generally render the diagnosis clear.

Prognosis.—If a case is properly treated complete recovery should take place in the course of from ten days to three weeks. In neglected cases necrosis of the septum and even death from pyæmia have been recorded.

Treatment.—The great essential in the way of treatment is to keep the nose absolutely clean, and to ensure this it should be frequently washed by means of gentle syringing with Collunarium Alkalimum (p. 29) and then sprayed with a mild astringent such as the Collunarium Hazelin (p. 49). In obstinate cases the application of alum (5 gr. to 1 oz.), sulphate of quinine (2 gr. to 1 oz.), argent. nit. (1 gr. to 1 oz.), or protargol (1 to 2 per cent.) to the nasal

mucous membrane by means of a soft camel-hair brush has been recommended, but it is impossible to apply them with accuracy in children and they can seldom be required in adults.

The patient's general health must be treated according to the special indications of the case. Cod-liver oil and tonics are generally indicated.

2. MEMBRANOUS RHINITIS

General Definition.—An acute inflammatory affection of the nasal mucous membrane, characterised by a membranous exudation.

The above definition is purposely vague, because etiologically and clinically there are several varieties of membranous rhinitis. From the general etiological standpoint it may be said that many irritants applied to the nasal mucosa may result in the formation of a membrane, provided they be of a sufficiently intense character. (See Membranous Pharyngitis, p. 423, and Laryngitis, p. 504.)

Varieties.—Clinically three varieties are met with, namely : (1) Traumatic membranous rhinitis ; (2) Nasal diphtheria, and (3) Fibrinous or croupous rhinitis.

(1) *Traumatic Membranous Rhinitis*

These cases are nearly always due to the application of galvanocautery to the nasal mucous membrane, though they have occasionally been met with after snaring or sawing operations. The site of the wound becomes covered with a white membrane, which extends beyond the limits of the injured part, but not often to any great extent. The false membrane, if left alone, separates with the eschar or scab, as the case may be, leaving a healthy mucous membrane beneath it. The patient's general health is unaffected.

(2) *Nasal Diphtheria*

This disease has been already discussed in Chapter iv. (p. 93), but a few of its essential characteristics may be repeated here in order to emphasise the difference between it and the third form of membranous rhinitis about to be described.

Nasal diphtheria is almost always co-existent with similar disease in the fauces, and generally occurs in cases of a severe type. The general constitutional symptoms are, therefore, marked from its commencement. The patient rapidly becomes seriously ill, and

early prostration is a constant sign. Albumen is commonly present in the urine, often in considerable quantities. The nasal discharge is profuse, always purulent, and frequently blood-stained. It is accompanied by a most disagreeable and almost characteristic foetor. The membrane is yellow in colour, closely adherent to the mucous membrane, and is often blown from the nostrils in the shape of casts of the nasal passages, and the local manifestations are always bilateral. Finally, nasal diphtheria is a most fatal disease, and in those who survive paralytic sequelæ are common and severe.

(3) *Fibrinous or Croupous Rhinitis*

Definition.—An acute inflammatory affection of the nose characterised by a membranous exudation accompanied by a thin, watery, and irritating discharge, and associated with the presence of Klebs-Loeffler bacilli or some variety of pyogenic organism, but differing materially from true diphtheria.

A great deal of confusion has surrounded this form of membranous rhinitis, especially with regard to its relation to diphtheria, but the atmosphere has been greatly cleared by more recent observations.

Etiology.—The main etiological factor is expressed in the definition given above; namely, infection with Klebs-Loeffler bacilli or some form of pyogenic organism, and it only remains to inquire into the relative frequency of these various organisms. The following statistics may be quoted: Wishart found Klebs-Loeffler bacilli in 69 out of 98 cases, and E. Meyer in 13 out of 21; whilst Lack, who examined 36 cases, found it invariably present; and in 9 cases investigated at the Throat Hospital Klebs-Loeffler bacilli were found in 6, Hoffmann's in 1, and pyogenic organisms in 2. It may therefore be concluded that the majority of cases are connected with Klebs-Loeffler bacilli, a few with Hoffmann's, and a few others with some variety of pyogenic organism. Amongst the latter the streptococcus pyogenes and the staphylococcus pyogenes aureus are the most common. Clinically it seems impossible to separate the cases due to Klebs-Loeffler bacilli from those due to pyogenic organisms.

A few other etiological factors must be mentioned. It is essentially a disease of childhood, occurring almost invariably before fifteen years of age, and generally before eight years. Being most commonly met with in August, September, and October,

it may be said to be a disease of the autumn months. It is practically confined to children of the poorer classes, which suggests that insanitary surroundings are a predisposing cause. Some cases have apparently been associated with atrophic rhinitis, measles, scarlet fever, and influenza. Finally, a previous attack seems occasionally to predispose the patient to another.

Pathological Changes.—The chief pathological change is a membranous exudation covering the inner and under surfaces of the inferior turbinates, the floor of the nose, and sometimes the septum. It is difficult to see how far it extends on account of the swollen condition of the parts. The membrane is greyish-white in colour and of varying thickness and density ; it is slightly adherent to the mucous membrane, and when separated leaves a raw red surface with a few bleeding points. It is accompanied by a thin watery discharge which runs down over the upper lip. Very rarely a patch of greyish membrane may be seen in the pharynx, most commonly on the lateral pharyngeal bands.

Symptoms and Course of the Disease.—1. **General Symptoms.**

—The constitutional symptoms are quite unimportant. In some cases the initial stages are unattended by any noticeable malaise, but in others there may be a history of slight feverishness, headache, languor, and loss of appetite for a day or so. It is never sufficient to lead the parent to keep the child in bed or seek medical advice, and after the first day or so the child seems quite in its usual health. The general symptoms being so slight, advice is not sought until the local symptoms are well marked.

2. **Local Symptoms.**—The symptoms for which the child is brought for advice are almost invariably nasal obstruction, nasal discharge, and excoriation of the alæ nasi and upper lip. The obstruction is always very marked, especially when the disease is bilateral. The discharge is as a rule thin, watery, and profuse, though occasionally it is scanty, thick, and yellow, and sometimes blood-stained, but there is never any foetor. Considerable excoriation is nearly always present. Epistaxis may occur, usually late in the disease when the membrane is separating. In about 25 per cent. of cases the disease is unilateral, when the differential diagnosis from a foreign body in the nose is a matter of importance and occasionally some difficulty.

The disease runs a subacute and occasionally almost a chronic course, sometimes lasting as long as twelve or fourteen weeks, but the average duration is about five weeks.

Prognosis.—Though the disease often lasts a considerable time, spontaneous recovery eventually occurs. Adhesions between the inferior turbinate and the septum have been found after recovery, but no more serious sequelæ have been noticed. Lack kept his thirty-six cases under observation for from two to three months, and in none of them did he notice any sign whatever of paralysis. In the nine hospital cases no paralysis nor other sequelæ were noticed. No fatal cases have been recorded.

Diagnosis.—The two affections from which membranous rhinitis has to be distinguished are true clinical diphtheria and the presence of foreign bodies. It will be readily seen from the above descriptions of nasal diphtheria and fibrinous rhinitis that the two diseases are very distinct from a clinical aspect. Nasal diphtheria is an acute affection accompanied by grave constitutional disturbances, often ending fatally and generally followed by paralysis amongst those who survive. Fibrinous rhinitis, on the other hand, is a mild, often almost chronic, complaint, unaccompanied by constitutional disturbances of any gravity, never ending fatally, and never followed by any sign of paralysis.

Whilst these broad distinctions can usually be drawn between the two diseases, it must be remembered that very mild cases of nasal diphtheria do occur, especially in adults, in which the symptoms closely resemble those of fibrinous rhinitis. Such cases, however, can almost invariably be traced to infection from diphtheria, and consequently, however mild the symptoms may be, they must be considered and treated as diphtheria.

It is often extremely difficult to differentiate a case of unilateral membranous rhinitis from foreign bodies in the nose by the symptoms, and the diagnosis must rest upon the results of a careful search for a foreign body. In the case of young children it may be necessary to administer a general anæsthetic.

Treatment.—The disease tends towards spontaneous recovery, and it is doubtful whether treatment has any great effect on its course. The symptoms, however, may often be relieved. The nose should be kept free from discharge and loose fragments of membrane removed by gentle syringing with a simple antiseptic nasal wash, such as Collunarium Alkalimum diluted to half its strength with water, or Collunarium Sanitas (p. 29). After cleansing, the Nebula Menthol (p. 44) should be applied to the mucous membrane with a spray or by means of a soft brush. The excoriation of the alæ and upper lip may be relieved and often

prevented by keeping the parts smeared with equal parts of vaselin and unguentum boracis, and if the throat is affected it should be swabbed with weak Condy's fluid. Internally half an ounce of the Mist. Ferri Perchloridi (p. 59) may be given, especially if the patient is in debilitated health.

Notification and Isolation.—A very important question for consideration is that of notification and isolation in those cases of fibrinous rhinitis in which the Klebs-Loeffler bacillus is found. It has been already seen that these bacilli occur in the majority of cases, and they are found in great profusion both in the discharges and in the membrane. On the other hand, it has been shown that clinically fibrinous rhinitis is a very different disease to nasal diphtheria; and, further, recent observations tend to show that fibrinous rhinitis never causes diphtheria in others nor does it arise through infection from diphtheria, though it is mildly infectious as fibrinous rhinitis from one child to another. This being so, there seems some room for doubt as to the necessity for notification and isolation. Considering, however, the difficulty of diagnosis in some few cases and the dangers of allowing a case of true nasal diphtheria to mix with other children, especially in schools, it is better to act on the safe side and treat fibrinous rhinitis in these respects as diphtheria. This question is full of interest and is further discussed in an appendix.

IV. RHINITIS DUE TO THE INTERNAL ADMINISTRATION OF DRUGS

Some drugs administered internally may produce acute rhinitis. This fact in relation to iodide of potassium is too well known to need more than mentioning. In some people arsenic will also cause rhinorrhœa with swelling and redness of the mucous membrane of the nose.

V. ACUTE RHINITIS DUE TO LOCAL IRRITANTS

This variety of acute rhinitis is called by some Traumatic Rhinitis, and by others Occupation-Rhinitis, as it is always incidental to the patient's trade or business. It occurs in two forms, which may be called respectively (1) the Simple and (2) the Destructive.

(1) **The Simple Form.**—This is in all cases due to direct irritation of the nasal mucous membrane by some foreign substance, and

met with, firstly, amongst those whose occupation exposes them to dust, such as that to which millers, sawyers, ivory-turners, and librarians are exposed; secondly, amongst those exposed to irritating fumes of certain chemical substances such as ammonia, chlorine, or iodine.

The pathological changes and symptoms are similar to those of acute catarrhal rhinitis, but when due to dust some foreign particles may often be seen adhering to the septum and anterior ends of the middle turbinates. The differential diagnosis from ordinary catarrhal rhinitis can only be determined by the history of the case.

Treatment.—The local treatment must be conducted on the lines recommended for simple acute catarrh (p. 192). The nasal cavities should be frequently cleansed with Coll. Alkalimum (p. 29) and afterwards sprayed with Neb. Menthol (p. 44). No general treatment is called for, but a change of occupation may have to be considered if the patient is so susceptible to the particular irritant to which he is exposed that he is constantly contracting attacks of acute rhinitis.

(2) **The Destructive Form.**—This variety is characterised by acute inflammation followed by sloughing of the mucous membrane and destruction of the cartilaginous septum. It is met with amongst those who work with bichromate of potassium, mercury, arsenic, or osmic acid. All these chemical poisons quickly destroy cell life, and if small particles are carried in the air-stream to the nasal cavities they quickly cause destruction of the mucous membrane.

The pathological changes and symptoms are first those of acute nasal catarrh, but later more marked and distinctive lesions occur. The discharge becomes thick and green, and adherent crusts free from *foetor* are formed chiefly over the septum, the separation of which is often accompanied by epistaxis. Later still there is sloughing of the mucous membrane and necrosis of the cartilage, leading to perforation of the septum. The posterior part of the cartilaginous septum is chiefly affected, and the resulting perforation is usually oval with smooth edges. Very rarely the bony septum may be also involved, and occasionally sloughing and necrosis of the inferior turbinates takes place.

The **Diagnosis** in most cases must rest upon the history of the case. When sloughing and perforation of the septum occur, the condition may have to be distinguished from syphilis, lupus,

or ozæna. In syphilis the bony septum is usually affected, in lupus the process is not nearly so acute, and in ozæna there is marked atrophy of the turbinates with foetid crusts.

Treatment.—All people whose occupation exposes them to this form of acute rhinitis should protect the nasal mucosa by means of plugs of moistened cotton wool worn in the nostrils directly any signs of nasal irritation occur. In some cases the question of a change of occupation may arise.

The local treatment recommended for simple acute catarrh (p. 192) should be adopted. It is especially important to cleanse the nasal cavities by the frequent use of Coll. Benzoini or Coll. Boracis (p. 48), and to prevent the formation of crusts by freely painting the septum with Nebula Hydrargyri Nitratis (p. 50) after using the nasal wash.

CHAPTER IX

CHRONIC INFLAMMATORY AFFECTIONS OF THE NOSE

CHRONIC CATARRHAL RHINITIS: *Classification—Etiology, Symptoms, and Treatment common to all Forms—Changes in the Inferior Meatus.—A. General Thickening.—B. Tumefaction.—C. Hyperplasia—Special Symptoms and Treatment—Changes affecting the Ethmoid Region.—A. Periostitis.—B. Osteitis, leading to (i) Enlargement of the Middle Turbinal, (ii) Cysts of the Middle Turbinal, (iii) Oedema and Polypi—Special Symptoms and Treatment.*

THE chronic inflammatory affections of the nose include many distinct pathological conditions which may be classified as follows :—

- I. Chronic Catarrhal Rhinitis.
- II. Chronic Dry Rhinitis.
- III. Chronic Purulent Rhinitis.
- IV. Atrophic Rhinitis with Ozæna.
- V. Rhinitis Caseosa.

1. CHRONIC CATARRHAL RHINITIS

Acute and chronic catarrhal rhinitis are responsible for a very great number of the morbid changes met with in the nasal passages and their accessory sinuses. As acute rhinitis often causes chronic rhinitis, and as the existence of a chronic rhinitis leads to frequent attacks of acute rhinitis, it is often impossible to place with exactitude the responsibility on either the one or the other for the various final conditions which may be met with in the nose. In this chapter, therefore, the inflammatory processes associated with rhinitis will be described, irrespective of the original cause—whether acute or chronic catarrh or both.

Definition.—Chronic catarrhal rhinitis may be defined as a chronic inflammation of the mucous membrane of the nose, characterised by engorgement of the blood-vessels, alteration of the secretions, and more or less thickening of the mucous membrane with or without oedema. In mild cases the thickening may be so slight as to be hardly noticeable to the naked

eye, whilst in severe cases there may be marked hyperplastic enlargement, definite outgrowths, or large oedematous inflammatory infiltrations.

Classification.—Whilst it is advisable to divide and subdivide this subject, both for the convenience of description, and in order that the many and varied conditions to which catarrhal rhinitis can give rise may be comprehended at a glance, it must be clearly understood that the morbid conditions enumerated are not separate diseases, but are all expressions of the one process. Indeed many of the changes may occur simultaneously, some in one part of the nose and some in the other.

The following is a useful classification of the various morbid conditions which occur in the course of, or result from, catarrhal rhinitis :—

A. Changes affecting the mucous membrane of the inferior meatus.

1. Slight general thickening.
2. Tumefaction or turgescence.
3. True hyperplasia.

B. Changes affecting the ethmoid bone and its process, the middle turbinal.

1. Periostitis.
2. Osteitis,

leading to

- a. Bony enlargement of the anterior end of the middle turbinal.
- b. Cystic dilatation of the anterior end of the middle turbinal.
- c. Oedema of the mucous membrane covering the anterior end of the middle turbinal.
- d. Polypi.

C. Changes affecting the accessory sinuses.

1. Mucoceles.
2. Acute inflammation.
3. Chronic suppuration.

It will be seen that the changes found in the ethmoid region differ very materially from those found in the inferior meatus. These different results are accounted for by the differences in the

minute anatomy of the two regions. The inferior meatus is lined by a thick and extremely vascular mucous membrane consisting of three layers, (1) the epithelial, (2) the fibro-vascular, and (3) the sub-mucous, in which are contained racemose glands and venous sinuses to which the erectile property is due (Macdonald).

The mucous membrane covering the ethmoid region is generally, on the contrary, comparatively thin, except over the lower edge of the middle turbinate, and there are but few venous sinuses. It has an epithelial covering and a submucous layer containing a free blood supply, and a large number of racemose and tubular glands. The connective tissue of this layer is so inseparably connected with the periosteum that the two membranes may be looked upon as one, or, in other words, as a muco-periosteum. The minute structure in the two regions being so different, the great differences in the results of chronic inflammation are not surprising.

In describing these various forms of chronic catarrhal rhinitis the following scheme will be adopted :—

	I	
Etiology		
Symptoms		
General treatment		
	}	Common to all forms.
	II	
Pathological changes		
Special symptoms		
Diagnosis		
Prognosis		
Local treatment		
	}	connected with
		1. The inferior meatus. 2. The ethmoid region. 3. The accessory sinuses.

I. ETIOLOGY, SYMPTOMS, AND GENERAL TREATMENT COMMON TO ALL FORMS OF CATARRHAL RHINITIS

Etiology.—Chronic catarrh being almost invariably a sequel of acute catarrh, the causes of the latter (see p. 189) are indirectly the causes of the former, and it only remains to inquire whether there are any special circumstances which may lead to the acute form becoming chronic. It may be stated that a particularly severe acute attack, especially when the result of measles,

influenza, or other specific fever, or a quick succession of milder attacks, is very likely to leave chronic inflammation ; that acute catarrh is likely to become chronic in tuberculous, gouty, or ill-nourished and neurotic subjects ; and that the presence of any source of persistent nasal obstruction, such as spurs and deviations of the septum or adenoid hyperplasia of the naso-pharynx, is extremely likely to cause subsequent chronic catarrh. Residence in low-lying damp places, exposure to irritating dust-laden air, excessive use of alcohol, tobacco, or snuff, bad hygienic surroundings, and dyspepsia, especially in gouty plethoric individuals, are also predisposing causes of chronic rhinitis, and may possibly be the exciting cause without a preceding acute attack.

Symptoms.—The two chief symptoms common to all forms of chronic rhinitis are nasal obstruction and discharge from the nose. Both the local and general objective and subjective results of nasal stenosis are fully dealt with under "Adenoids" (p. 383). In chronic rhinitis the degree of obstruction depends partly on the amount of hyperplasia and partly on the anatomical construction of the nasal fossæ. Thus slight hyperplasia will produce marked obstruction in narrow passages, whilst in unusually patent passages there may be great hyperplasia without any respiratory difficulty. The width of the nasal passages must, therefore, always be taken into consideration in determining the exact line of treatment.

The secretions from the inflamed nasal mucosa are generally greatly in excess of the normal quantity and of a muco-purulent character. The amount and character, however, vary very much in the course of the twenty-four hours. Early in the morning the discharge is scanty and viscid and is blown from the nose with considerable difficulty ; as the day goes on it is looser and more abundant. In warm dry rooms it again becomes viscid, whilst on exposure to cold, especially if there is a wind, it becomes very profuse and watery, and the tip of the nose may become very red. Under certain circumstances the discharge becomes permanently viscid and scanty, the mucous membrane becomes dry, and rhinitis sicca is established (see p. 298).

Various *complications* may occur due either to spreading of the inflammation, to the irritation of the discharges, or to mouth breathing. The following are the most important : Catarrh of the Eustachian tube, dry inflammation of the middle ear, or acute and chronic suppuration of the middle ear ; chronic pharyngitis, laryngitis, tracheitis, and bronchitis with a liability to acute

exacerbations; lachrymation, conjunctivitis, and occasionally tinnitus aurium without any discoverable changes in the middle ear.

General Treatment.—This consists in treating any general condition which may directly or indirectly influence the existence and persistence of chronic catarrh. In the plethoric, gouty, alcoholic, and dyspeptic types, the careful regulation of the diet, regular exercise and habits, and the avoidance of all alcohol, late hours, and overheated rooms, will do much to reduce the chronic rhinitis. A morning dose of *Mistura Alba* or some natural aperient water, so as to produce one free watery evacuation every day, and the administration of a dose of *Mist. Rhei cum Nuce Vomica* (p. 60) an hour before each meal, will also be beneficial. If the patient is unable to take regular outdoor exercise, Turkish baths and massage will often be found a good substitute. In the case of well-to-do patients suffering from chronic rhinitis due to indiscretions of diet or too free a use of alcohol, a course of treatment at some watering-place, such as Ems, may be recommended, and will usually be followed by good results.

In patients of the thin neurotic type the diet should be nourishing and generous, including a free supply of fats; while, medicinally, tonics are generally indicated. Iron, strychnine, and arsenic are among the most valuable drugs. Arsenic is especially useful, for, besides acting as a tonic, it seems to have a direct action in controlling the inflammatory process. The *Mistura Arsenici Alkalina* (p. 60) may be given three times a day after food, or if the patient is anaemic and nervous it may be combined with iron and *nux vomica* in the following mixture:—

Citrate of iron and ammonium	10 gr. = 0·69 gr.
Carbonate of ammonium	5 gr. = 0·34 gr.
Fowler's solution	3 m. = 0·18 c.c.
Tincture of <i>nux vomica</i>	5 m. = 0·31 c.c.
Glycerin	15 m. = 0·94 c.c.
Water	to 1 oz. = 30 c.c.

During the winter months cod-liver oil in some form is useful in preventing acute exacerbations, and often a glass of good Burgundy with lunch and dinner will be of use. Everything possible should be done to improve the patient's tone and resisting powers. Fresh air inside and outside the house, and out-door exercise, always stopping short of fatigue, are most important, and for people who get a healthy reaction, a morning cold bath followed by friction with a rough towel is very useful.

In fact all the suggestions for preventing acute catarrhs enumerated on p. 196 should be carefully followed out.

If there is any reason to think that the patient's occupation is causing or keeping up the nasal condition, it may be necessary in a few instances to consider the advisability of change of work ; but, though this would undoubtedly often effect a cure, it must not be lightly recommended. The symptoms are generally more uncomfortable than serious, so that such measures are but seldom necessary.

II. PATHOLOGICAL CHANGES, SPECIAL SYMPTOMS, AND LOCAL TREATMENT OF THE VARIOUS FORMS OF CATARRHAL RHINITIS

A. CHANGES AFFECTING THE MUCOUS MEMBRANE OF THE INFERIOR MEATUS

- (1) Slight general thickening.
- (2) Tumefaction or turgescence.
- (3) True hyperplasia.

Pathological Changes.—(1) **Slight General Thickening.**—This is the earliest and least severe change connected with chronic rhinitis. The mucous membrane looks thick and sometimes sodden ; it is congested and generally of a dark red colour, though occasionally it is pale. These changes are usually first noticeable and most marked in the inferior turbinal and especially at its lower free margin.

(2) **Tumefaction or Turgescence.**—By this is meant an intermittent or persistent over-engorgement of the venous sinuses contained in the deeper layers of the mucous membrane covering the inferior turbinate bone, the floor of the nose, and the lower part of the septum ; and it may be looked upon as the second stage of chronic catarrh of the inferior meatus. The inferior turbinals are pale or dull red in colour, large, full, and smooth with rounded surfaces. When examined with a probe this swelling is found to be very soft and almost fluctuating, whilst under pressure it quickly empties, but as rapidly refills when the pressure is withdrawn. In marked cases the turbinals may be in contact with the septum, especially if there is a spur or deviation which narrows the passage. These changes are generally bilateral, though usually more marked on one side than on the other. On

the application of cocaine and supra-renal extract complete collapse of the turgescent mucous membrane occurs. When the floor and lower part of the septum are affected the nasal obstruction is greatly increased. Turgescence of the septum looks very



FIG. 100.—Hyperplasia of the inferior turbinate. (From a specimen kindly lent by Dr. Lack.)

like a spur, but it is soft and gives readily to the pressure of a probe.

When there is intermittent turgescence, there may be no swelling at the time of examination, but the mucous membrane looks thickened as described above, and on careful observation depressions can often be seen on the septum, caused by pressure of the inferior turbinals during their periods of tumefaction. Accompanying the signs of turgescence some mucoid or muco-purulent discharge can often be seen lying in the irregularities of the nasal chambers.

The posterior ends of the inferior turbinals may share in the turgescence or may alone be affected. They appear, when seen by posterior rhinoscopy, as rounded, pinkish-grey tumours of

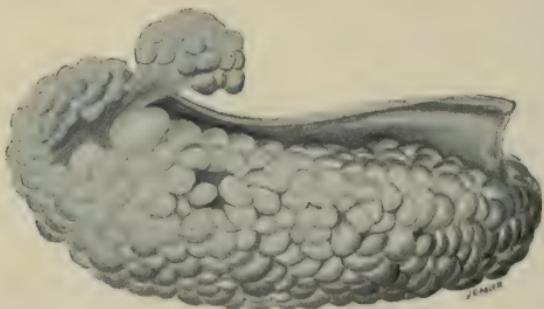


FIG. 101.—Advanced stage of hyperplasia of the inferior turbinate. (From a specimen kindly lent by Dr. Lack.)

variable size with slightly uneven surfaces. They cause more or less blocking of the lower half of the posterior choanæ, and sometimes project backwards into the post-nasal space.

(3) **True Hyperplasia.**—This is the third or final stage of chronic catarrh of the inferior meatus. Though hyperplastic

swellings may be seen on the floor or on the septum, the inferior turbinals are most frequently affected. Either the anterior or the posterior ends may be involved, or hyperplastic outgrowths may occur along their whole length. When hyperplastic changes commence in an already turgescent turbinal, some irregularity of

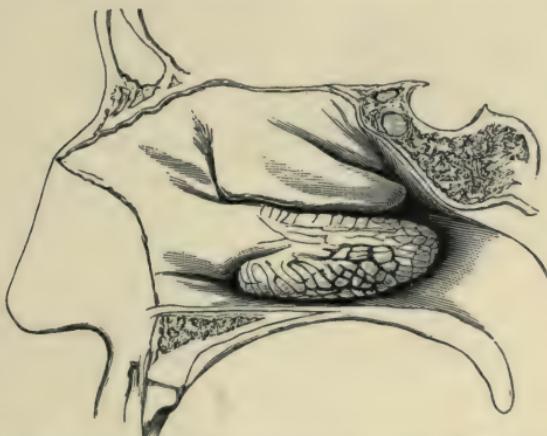


FIG. 102.—Hyperplasia of the posterior end of the inferior turbinate.

the surface may be first noticed. It may become at first slightly granular and then distinctly corrugated (Fig. 100) or furrowed by one or more grooves running in an antero-posterior direction and later still studded with small rounded elevations (Fig. 101). Finally, definite cauliflower-like outgrowths appear, which tend to gravitate towards the inferior border of the turbinal, so that often large masses become tucked away beneath its inferior concave surface, whence they can be lifted out with a probe. They have a long sessile attachment to the lower free border. When there is hyperplasia of the posterior end the surface is grey and uneven (Figs. 102 and 103), or resembles a mulberry both in form and in colour (Fig. 104). These hyperplastic ends often become very large and may sometimes interfere with the functions of the Eustachian tubes. True hyperplastic swellings are firm and resistant to the probe, and do not themselves collapse on the application of cocaine, though the size of

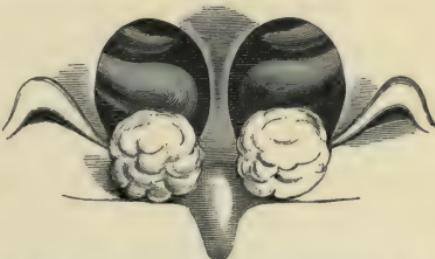


FIG. 103.—Pale-coloured hyperplasia of the posterior ends of the inferior turbinates.

the whole turbinal may be diminished by reduction of co-existing turgescence.

Special Symptoms.—In cases of slight general thickening, and in those of slight tumefaction, the amount of nasal obstruction is often very variable. At times the nasal cavities may be

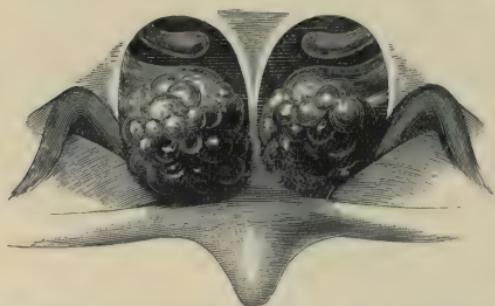


FIG. 104.—Mulberry-like hyperplasia of the posterior ends of the inferior turbinates.

quite free and at other times one or both of them almost entirely occluded. Increased obstruction often occurs on the side on which the patient lies at night, or one or both sides may become blocked in hot, dry, ill-ventilated rooms. Statements to this effect are very often

volunteered by patients. In cases of true hyperplasia the obstruction is generally constant.

Diagnosis.—There may be some little difficulty in distinguishing tumefaction from hyperplasia and gummatous infiltration, and hyperplastic outgrowths from polypi and tuberculous tumours. Careful consideration of the pathological changes described as characteristic of each of these conditions will usually lead to a correct diagnosis, though it is occasionally very difficult to differentiate between a tuberculous tumour and a hyperplastic growth. The former is paler and generally shows some sign of superficial ulceration, and there is an absence of chronic inflammatory changes in the surrounding mucous membrane or in other parts of the nose. In doubtful cases a portion of the growth should be submitted to microscopical examination so that a definite diagnosis may be made.

Prognosis.—With appropriate treatment the prognosis is very favourable in all these conditions. Slight thickening and tumefaction of the mucous membrane may get well spontaneously if not of too long duration.

The Local Treatment will necessarily vary according to the exact stage of the disease and the region chiefly affected.

1. **Of Slight General Thickening of the Mucous Membrane.**—This condition will generally yield to local applications, combined with general treatment on the lines already indicated (p. 212), provided the patient will persevere with them for a sufficiently long time.

It is of the first importance to keep the nasal cavities free from unhealthy secretions, which are always irritating to the mucous membrane. This is best effected by the use of Collunarium Alkalimum (p. 29) every night and morning, and once in the middle of the day if the discharge is very profuse. It should be sniffed from the hand or used by means of a nasal irrigator or coarse spray (p. 43). In cases of short duration the use of a cleansing lotion alone will often effect a cure. If the discharge is very profuse, the Collunarium Hazelin (p. 49) may be substituted for the Collunarium Alkalimum ; and if sticky and difficult to blow from the nose, five grains of sodium chloride should be added to each ounce of the Collunarium Alkalimum, or the Collunarium Ammonii Chloridi or Boracis (p. 48) substituted for it. In old standing cases, when the use of lotions has to be continued for long periods, progress often seems quicker if the lotion is frequently varied. As alternative cleansing lotions the following may be used :—Collunarium Sanitas (p. 29), Collunarium Boro-glyceride (p. 48), Collunarium Alkalimum Co. (p. 47), Collunarium Menthol Co. (p. 48).

In cases of slow progress the patient should use the Nebula Menthol (p. 44) after cleansing the nostrils with the lotion, or dry inhalations of creosote or oil of Scotch Pine (p. 53) may be employed by means of Mackenzie's respirator (Fig. 47, p. 53) night and morning. Stronger applications have been recommended in the form of paints, such as nitrate of silver (2 to 10 gr. to 1 oz.), or chloride of zinc (5 gr. to 1 oz.), but they are seldom advisable (p. 28). Finally, if there is any source of permanent nasal obstruction, such as spurs and deviations of the septum or adenoids, it should certainly be removed by operative measures.

2. Of Tumefaction.—In slight cases the simple treatment just described is usually sufficient, and nothing further is required. In old standing or marked cases, however, more active treatment is necessary, with the object of reducing the turgescence of the vascular tissue and relieving the nasal obstruction. The following methods are available :—(a) The application of the galvano-cautery ; (b) The application of caustics ; (c) Partial turbinectomy ; (d) Complete turbinectomy.

(a) **The Application of the Galvano-Cautery.**—This is the best method of reducing the swollen mucous membrane of the inferior turbinals, and is usually efficacious. General directions for the use of the cautery in the nose and for the induction of local

anæsthesia, which is always necessary, have already been given on pp. 32 and 63 respectively. For the reduction of turgescence the cautery may be employed in one of two ways, namely : (1) Linear, and (2) Punctiform cauterisation. With either method the object is to cause reduction of the vascular tissue by contraction of scar tissue or by adhesions between the mucous membrane and bone, *without* destroying more of the surface of the mucous membrane than is absolute necessary. Therefore a fine cautery point is selected with the platinum wires in the horizontal plane (Fig. 105).



FIG. 105.—
Cautery point.

Linear Cauterisation is the safer and better method, and should always be tried first. When the parts are sufficiently anæsthetised, the cautery point is introduced cold into the nose, under a good illumination, and placed on the turbinal as far back as necessary. The wire is then heated and drawn with steady pressure from behind forwards to the anterior extremity of the turbinal and then removed (see also p. 32). Great care must be exercised not to injure the septum, for, if this is accidentally burnt, adhesions between it and the turbinate body are almost sure to follow. Cauterisation usually requires to be repeated once or twice at intervals of a week or ten days before a fully satisfactory result is obtained.

Punctiform Cauterisation.—If sufficient progress is not being made, punctiform cauterisation should be tried. This consists in plunging a fine cautery point into the substance of the inferior turbinate down to the bone, retaining it there one or two seconds and then withdrawing it. This may be done at one or two points at each sitting.

Though the inferior turbinal is the part generally and chiefly affected with turgescence, it must be remembered that the floor of the nose or the lower part of the septum may be involved, in which case the use of the cautery in these regions often greatly hastens a satisfactory result.

The electric cautery can also occasionally be used for the reduction of vascular enlargement of the posterior ends of the inferior turbinals, and if it can be applied by means of direct vision through the anterior nares, it should be tried when simple methods have failed to relieve the symptoms. Cocaine and supra-renal extract solution is applied to the whole length of the inferior turbinal, until, with the help of a good illumination, the

posterior end can be seen and the cautery applied. Either a linear or a punctiform burn may be employed as described for the anterior end, but the punctiform method is generally the more efficacious for the posterior end. In these cases it is especially important to be able to see and guide the cautery point, as otherwise injury may be done to the septum or to the Eustachian cushions, leading to adhesions and ear complications respectively.

If it is impossible from narrowness of the nasal fossæ or from excessive swelling of the soft structures to obtain a view of the posterior end, removal by operation is better than attempting to apply the cautery through the mouth (p. 35).

(b) **Application of Caustics.**—For the reduction of turgescence in the anterior parts of the nasal cavity, chromic acid is far superior to any other caustic acid, and is to all intents and purposes as good as the cautery for linear cauterisation. It is preferred by some on the grounds that it is less painful and produces less inflammatory reaction. It may be used either dry by fusing it on to a fine probe (p. 36), or as a saturated solution. For general directions as to the method of applying it and other caustics in the nose, see p. 36. Linear cauterisation with chromic acid is carried out in precisely the same way as with the galvano-cautery.

After the use of both cautery and chromic acid certain precautions are necessary to prevent complications. Pledgets of cotton wool should be worn in the nostrils for the first twelve hours, and afterwards the nasal cavities should be kept clean with Collunarium Alkalimum (p. 29).

(c) **Partial Turbinectomy.**—Either the anterior end or the posterior end of the inferior turbinal, and occasionally both the anterior and posterior ends, may require removal when the simpler methods just described have failed to relieve the symptoms of nasal catarrh and obstruction.

Anterior Turbinectomy.—There are various methods of removing the anterior part of the inferior turbinal of which the following are the best:—(1) with scissors or snare, (2) with scissors and snare combined, and (3) with the spoke-shave. Whichever method is adopted local anæsthesia should be induced by the application of cocaine and supra-renal extract so as to render the operation as painless and bloodless as possible.

(1) Scissors alone may be used when it is necessary to remove only a very small portion of the anterior end. The scissors

should be angular, with strong but narrow vertical blades and rounded points (Fig. 106). Local anaesthesia having been induced, the scissors are introduced at the outer border of the turbinal, one blade above and the other below the portion to be removed, and pushed inwards in a slanting direction towards the septum. When the points are well beyond the inner border of the turbinal,

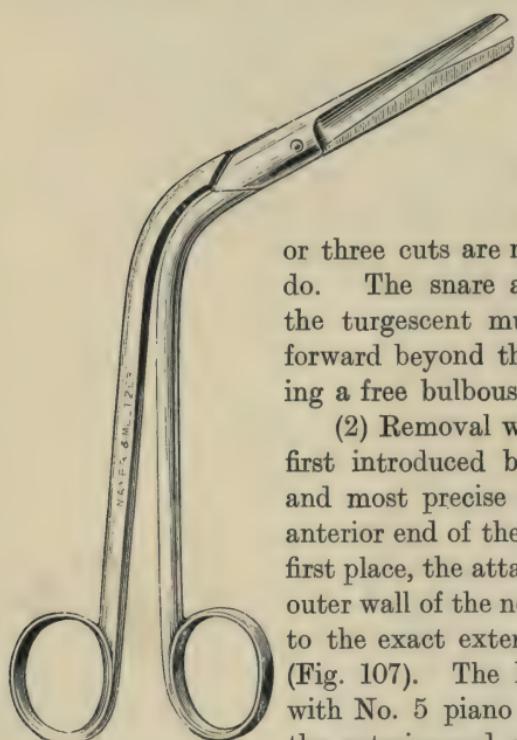
the blades are sharply and firmly closed. A little onward pressure should be made whilst closing the blades, otherwise the scissors are liable to slip backwards and two

or three cuts are necessary where one would do. The snare alone may be used when the turgescent mucous membrane projects forward beyond the bony attachment forming a free bulbous end.

(2) Removal with scissors and snare was first introduced by Lake, and is the best and most precise method of removing the anterior end of the inferior turbinal. In the first place, the attachment of the bone to the outer wall of the nose is divided with scissors to the exact extent of the desired removal (Fig. 107). The loop of a snare, threaded with No. 5 piano wire, is then passed over the anterior end of the turbinal and carried along the incision, whilst the barrel of the

FIG. 106.—Nasal scissors.

snare is carried backwards between the inferior turbinal and the septum. When the loop has travelled the length of the incision the wire is quickly tightened until the portion to be removed is firmly grasped. The actual division of the tissues is then carried out by very slowly tightening the wire loop, because the structures to be divided are highly vascular, and troublesome haemorrhage may occur if it be done too rapidly. It is very important that the snare for this operation should be adjustable for both rapid and slow action, so that the part to be removed may be quickly grasped and then divided slowly. Lack's snare (Fig. 108) best answers these requirements, but the operation can quite well be performed with Mackenzie's (Fig. 109) or Macdonald's snares.



(3) The spoke-shave (Fig. 112, p. 224) has the advantage of being very rapid in its action, but from this very fact it has the disadvantage of being more likely to be followed by troublesome

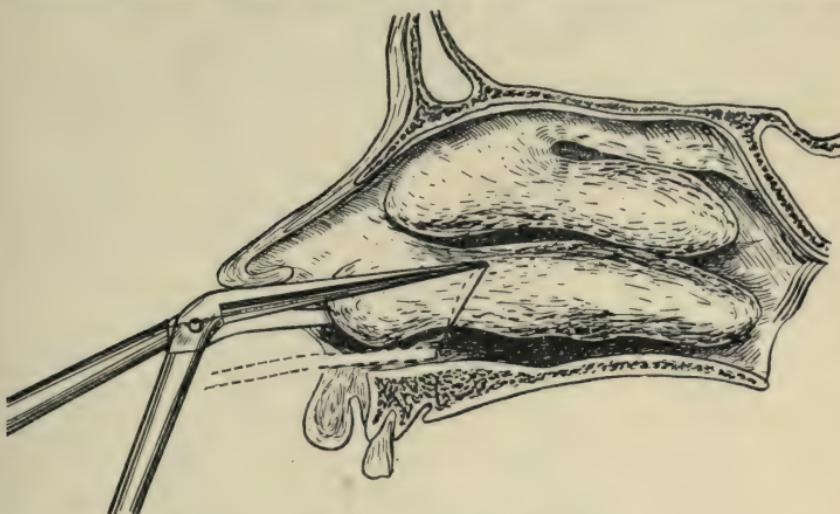


FIG. 107.—Method of removing the anterior end of the inferior turbinate with scissors and snare.

haemorrhage than either of the former methods, and, further, the exact extent of the amputation cannot be so well regulated. The first step is to make a small cut with the scissors through the mucous membrane at the anterior attachment of the turbinate

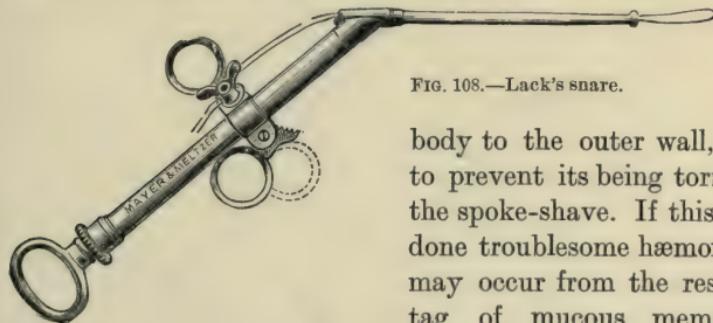


FIG. 108.—Lack's snare.

body to the outer wall, so as to prevent its being torn with the spoke-shave. If this is not done troublesome haemorrhage may occur from the resulting tag of mucous membrane.

The next step is to introduce the spoke-shave with the convex surface of its cutting blade facing outwards, and to place it in contact with the inferior turbinal at a point as far back as it is wished to remove that body. The spoke-shave is then sharply withdrawn in a slanting direction, so that the incision made by it shelves into the cut which was previously made with the scissors.

Posterior Turbinectomy may be described here though it is very

much more often required for hyperplasia than for simple turgescence. It is carried out by means of a snare, which may be guided

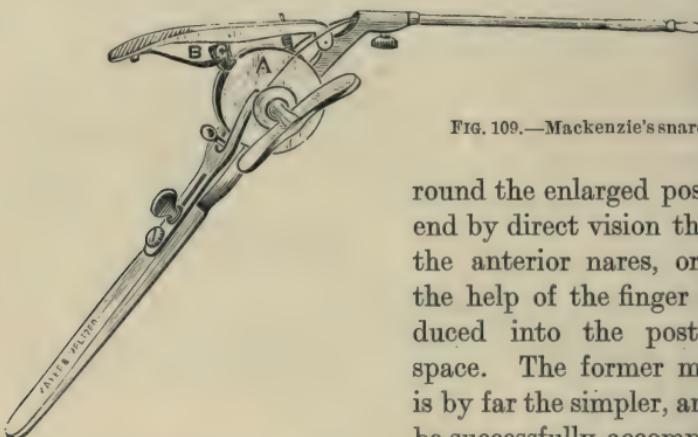


FIG. 109.—Mackenzie's snare.

round the enlarged posterior end by direct vision through the anterior nares, or with the help of the finger introduced into the post-nasal space. The former method is by far the simpler, and can be successfully accomplished

in a great number of cases. General anaesthesia is not necessary, but local anaesthesia must be induced, and complete collapse of the swollen mucous membrane obtained, by packing the whole length of the inferior meatus for ten minutes with pledgets of cotton wool soaked in solution of cocaine and supra-renal extract (p. 64). A snare adjustable for both rapid and slow action is selected, and the loop is strongly curved towards the side to be operated on, and it is then passed along the floor of the nose until the loop is free in the post-nasal space. The curve of the loop, though straightened during its passage through the inferior meatus, will recoil directly it is free in the post-nasal space, and then by gently withdrawing the snare, still keeping it low down on the floor of the nose, the loop will engage the posterior end and some resistance to its further withdrawal will be felt. Directly this occurs the loop should be quickly tightened until it is felt that the posterior end is within its grasp. In tightening the wire, the end of the loop should be made the fixed point and the barrel of the snare allowed to pass inwards towards the posterior end,



FIG. 110.—Method of bending loop.

as shown by the dotted lines in Fig. 111. If on the contrary the snare is held firmly whilst the wire is tightened, the loop will be pulled off the posterior end. When the swollen mucous membrane is successfully grasped it must be very slowly divided so as to avoid undue haemorrhage.

Instead of giving the loop a simple bend towards the side to be operated on, a double bend may be made, as shown in the accompanying illustration (Fig. 110). It will then be found that

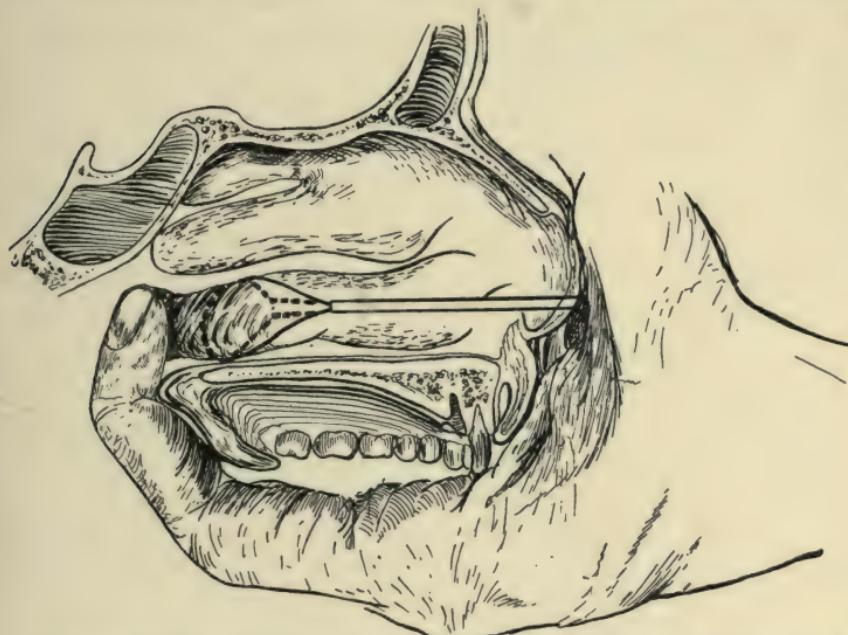


FIG. 111.—Removal of the posterior end of the inferior turbinate. The dotted line shows how the snare should be allowed to pass backwards as the loop is tightened.

on tightening the wire the loop falls towards and easily engages the posterior end.

If this method is unsuccessful, or if the patient happen to be under an anaesthetic for some more extensive operation, the finger should be introduced into the post-nasal space and the loop of the snare, having been passed through the nose, should be guided by it round the posterior end and there held whilst the loop is tightened (Fig. 111).

Complete Turbinectomy.—Occasionally there may be such enormous enlargement of the whole inferior turbinal that the use of cautery and partial removals may be insufficient to relieve the obstruction. The question of complete turbinectomy will then

arise. Though the operation is very simple and practically devoid of immediate risks, it must not be undertaken save under exceptional circumstances, because functionally the inferior turbinals are important structures, being responsible for warming the inspired air to body heat and saturating it with moisture. It is indicated in a certain class of cases in which there is a constant and profuse discharge, in which cauterisation or interference of any sort seems only to aggravate the trouble, and in which the obstruction to nasal respiration is almost complete. It is also indicated in some cases of hay fever and paroxysmal rhinorrhœa (p. 364). It is strongly contra-indicated whenever there is the slightest tendency to dryness.

The operation is best performed by means of a spoke-shave (Fig. 112). A general anaesthetic having been administered the anterior attachment of the inferior turbinal is divided for about half an inch with a pair of angular scissors to prevent tearing of the mucous membrane. The finger is then introduced into the post-nasal space and the spoke-shave, having been passed through the nose with its convex cutting surface outwards, is guided by the finger over the posterior end. It is then sharply and quickly pulled forward, keeping the cutting edge pressed firmly against the outer wall of the nose. The severed turbinal is sometimes pulled out of the nostril with the spoke-shave, though more often it has to be removed with forceps afterwards. The haemorrhage may be very profuse, but as a rule it quickly subsides; but if it does not, packing the nose lightly with gauze is generally efficacious. In a few instances really serious bleeding may occur at the time or later, in which case systematic plugging of the anterior nares, and possibly of the posterior nares as well, will be necessary. For the methods of arresting haemorrhage from the nose, see Chapter iii., p. 72.

The *results* of this operation in well-selected cases are very satisfactory. The nasal obstruction is relieved and the profuse discharge is abated, but in badly-selected cases the results are most distressing. The inferior meatus is left too large, the mucous membrane becomes extremely dry, and all the signs and symptoms of a severe dry rhinitis are established, with secondary dry pharyngitis and laryngitis. Various forms of acute and chronic

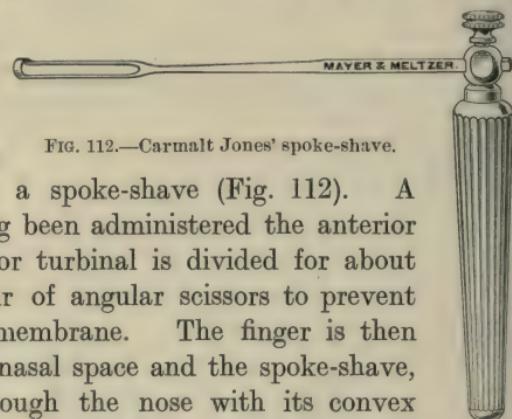


FIG. 112.—Carmalt Jones' spoke-shave.

lung troubles are not uncommon owing to the air being unwarmed and unmoistened, and finally there is some risk of setting up a condition simulating atrophic rhinitis with ozæna, an instance of which has been reported by Stewart.

3. Of True Hyperplasia of the Inferior Turbinated Body.—

(1) **Of the Anterior End.**—The treatment will necessarily depend upon the exact stage of the hyperplasia. In the early stages where a turgescent turbinal is only just becoming hyperplastic, cauterisation as described above together with nasal washes is often sufficient. In rather more advanced cases, or when the cautery has failed, amputation of the anterior end (p. 219) is called for. If the hyperplasia has assumed the form of a definite outgrowth, removal with a snare is the best method. Local anaesthesia should be induced with cocaine and the limits of the hyperplastic growth defined with a probe. The loop of a snare (p. 221) is then guided over the growth, tightened quickly till it is grasped, and then slowly tightened until the tissues are severed. Occasionally the loop of the snare slips off a portion of the growth whilst it is being tightened, and a second operation becomes necessary to clear the nostril completely. This may sometimes be prevented by first partly severing the hyperplastic tissues from the inferior turbinal with a pair of angular scissors (Fig. 106, p. 220), and then passing the end of the snare along the incision whilst the loop is passed between the growth and the septum over its posterior limit. If there is much turgescence of the mucous membrane it may be necessary to apply the cautery once or twice to the inferior turbinal when the operation wound is quite healed, in order to remove all traces of nasal obstruction.

(2) **Of the Posterior Ends.**—If true hyperplasia exist, the use of lotions and the application of the cautery are of no avail. Should the overgrowth be sufficient to cause symptoms of nasal stenosis or to interfere with the orifice of the Eustachian tube, the posterior end must be removed by one of the methods already described (p. 221).

The After-treatment of all these minor operations just described consists in protecting the wound by the insertion of a pledget of cotton wool into the vestibule of the nose for the first twenty-four hours, followed by the use of the alkaline nasal wash (p. 29) night and morning till healing is complete. Certain complications may occasionally arise, which have been described and their preventive and curative treatment discussed in Chapter iii. p. 70.

B. CHANGES AFFECTING THE ETHMOID BONE AND ITS PROCESS
THE MIDDLE TURBINAL

1. Periostitis.
2. Osteitis.

Leading to—

- a. Bony enlargement of the anterior end of the middle turbinal.
- b. Cystic disease of the anterior end of the middle turbinal.
- c. $\text{\textcircled{E}}$ edema of the mucous membrane covering the anterior end of the middle turbinal.
- d. Polypi.

Pathological Changes.—When it is remembered that the ethmoid bone is covered by a thin mucous membrane, the deeper layers of which are inseparably connected with the periosteum (p. 210), it can be readily understood that acute or severe chronic inflammation of the mucous membrane cannot occur in this region unless there also be a periostitis. Periostitis here, as elsewhere, always causes, to a greater or less extent, pathological changes in the underlying bone. These bone changes consist of osteophytic osteitis, rarefying osteitis with or without suppuration, sclerosing osteitis, and, very rarely, necrosis. As first pointed out by Woakes, whose statements have been more recently corroborated by the extensive investigations of Lack and others, all the inflammatory changes in the ethmoid region now under discussion are concomitants of the pathological processes occurring in the bone and cannot be dissociated from them. Osteophytic changes are generally the result of chronic forms of catarrhal inflammation, and lead to enlargement of the bone. Rarefying osteitis, on the other hand, is most frequently the result of acute inflammations, and leads to disintegration and absorption of the bone, or, if suppuration occurs from infection with pyogenic organisms, to caries. It is this form which is associated with $\text{\textcircled{E}}$ edema and polypi. Sclerosing osteitis is probably the final condition of an arrested rarefying osteitis, and is often found underlying a single polypus. Necrosis is extremely rare as a result of a simple inflammatory process, probably owing to the free supply of blood to the part.

The four clinical conditions associated with periostitis and

osteitis of the ethmoid bone must be further and separately considered.

1. Enlargement of the Anterior End of the Middle Turbinate Bone.—This is due to osteophytic osteitis, which causes a gradual enlargement of the bone and a roughening of the surface. It is nearly always limited to the anterior third of the middle turbinal, probably because this is the part exposed to the irritation of dust and other impurities carried by the current of inspired air. On examination the anterior end appears big and sometimes bulbous, whilst the mucous membrane covering it is red, dry, and shiny. The enlarged middle turbinal, except in unusually wide nares, lies in contact with the septum and is often tightly packed against it, or even in rare instances displaces it towards the opposite side.

2. Cysts of the Middle Turbinal.—In about 30 per cent. of skulls Logan Turner has found in the anterior end of the middle turbinated bone an accessory cell, the ostium of which opens into the middle meatus (Fig. 123). If this ostium becomes blocked with inflammatory products, retention of secretions and subsequent dilatation of the cell will occur, so as to form a cyst. Such cysts vary greatly in size, but as a rule do not exceed that of a filbert, though occasionally they may become enormously developed, causing complete nasal obstruction, separation of the nasal bones, and external deformity. The retained secretions may be mucoid (see *Mucoceles*, p. 250) or purulent. When purulent the condition is often associated with polypi, and the mucous membrane lining the cyst and its duct may undergo polypoid degeneration, whilst the bony walls show signs of rarefying osteitis. Sometimes the floor of the cyst becomes absorbed and oedematous mucous membrane protrudes, producing one of the conditions described as cleavage of the middle turbinal. At other times the retained pus bursts through the lower wall of the cyst into the inferior meatus, leaving a discharging sinus.

3. Oedema of the Mucous Membrane covering the anterior end of the middle turbinal is very common in cases of even slight catarrhal rhinitis, and, in its least marked forms, can hardly be considered of clinical importance. In these slight cases the mucous membrane covering just the anterior end looks pale and semi-transparent, and can be moved on the underlying bone with a probe. In severer cases, not only the tip of the turbinal, but more or less

of its under surface is affected, resulting in large movable cedematous masses, which block the middle meatus and often cause symptoms. Occasionally the posterior end may be similarly affected. The mucous membrane of the outer wall of the middle meatus round the uncinate process may also become swollen and cedematous, and come in contact with the cedematous middle turbinal. This accounts for some other cases erroneously described as cleavage of the middle turbinal.

Any oedema of the mucous membrane covering the middle turbinal or other parts of the ethmoid bone shows microscopically all the distinguishing features of polypi, and accompanying the inflammatory oedema there is undoubtedly an early stage of rarefying osteitis. If the osteitis is arrested, sclerosis of the bone will occur and the oedema will disappear or remain stationary. If on the other hand the osteitis continues, the oedema will increase and spread and gradually produce the clinical characteristics of nasal polypi about to be described. Thus, if a sufficient number of patients be examined, it is possible to find every stage in the development of polypi from mere thickening and slight oedema of the mucous membrane to the typical pedunculated form.

4. Polypi.—From what has already been said it is evident that a polypus cannot be regarded as a new growth, as it was once thought to be. It must now be looked upon as but a symptom of bone disease (Woakes); as "an ordinary inflammatory production peculiarly modified by the physical conditions in which it exists" (Macdonald); or "as a localised cedematous infiltration of the nasal mucous membrane, the result of osteitis of the underlying bone" (Lack). In other words, a polypus is a localised inflammatory oedema of the muco-periosteum of the ethmoid region, inseparably associated with past or present disease of bone. Histologically, polypi consist of structures normal to the mucous membrane in varying quantities, together with inflammatory products and oedema. When the polypi are limited in number to one or two and are surrounded by healthy mucous membrane, it is probable that the rarefying osteitis has become arrested and the underlying bone sclerosed. On the other hand, when active bone disease continues, the mucous membrane becomes more and more cedematous and more and more polypi are developed. The bony structures disintegrate and are absorbed; or, if infection with pyogenic organisms has

occurred, they crumble away and are discharged in small fragments with the pus. In either case the whole of the ethmoid bone may be affected and the normal outlines of this region may be entirely lost.

Polypi are extremely rare under ten years of age and commonest between the ages of twenty and thirty. Clinically a polypus is smooth, oval or round, sessile or pedunculated ; it is grey with a tinge of pink, semi-translucent, and of gelatinous consistency ; and it is freely movable on its attachment with a probe unless



FIG. 113.—Large polypus removed by Sir Morell Mackenzie.

mechanically fixed by its surroundings. They vary in size according to their position ; in the anterior nares they may be as small as a pea, or completely fill the nasal cavity (Fig. 113), whilst in the post-nasal space they may reach even greater dimensions (Fig. 191, p. 410). Occasionally when a polypus protrudes forwards into the vestibule or backwards below the soft palate it becomes red in colour, dry, rough, hard, and resistant. Polypi are generally multiple and often bilateral, and when they are very numerous or attain a great size they may widen the nose and cause external deformity. They may spring from any part of the ethmoid, but are especially common on the uncinate process, and round the bulla ethmoidalis, along the inferior free border of the middle turbinate (Fig. 114). In many cases the polypi are bathed in pus due to suppurative caries, and in about 35 per cent. of cases there may be signs and symptoms of pus within one or other of the accessory sinuses.

Special Symptoms.—Swelling of the anterior portion of the

middle turbinal whether caused by oedema of the mucous membrane, thickening of the bone, or cystic disease, may in some instances produce a special train of symptoms if it comes into contact with, or causes pressure against, the septum. When in contact with the septum, the patient will often complain of nasal obstruction even though the inferior meatus is quite free, and though, on making a distinct effort, he can breathe fairly freely through the nose. This is explained by the fact that the natural

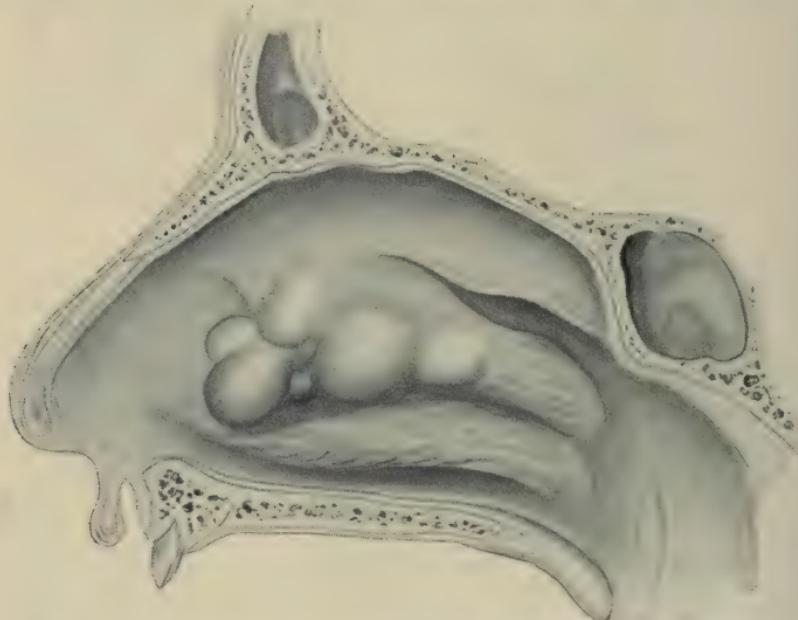


FIG. 114.—Polypi growing from the outer wall of the nose and middle turbinate.

air-way curves upwards and backwards through the middle meatus, and an effort is necessary to divert the air from its course and draw it through the inferior meatus. There may also be aprosexia or difficulty in concentrating the attention, anosmia, a peculiar thick nasal intonation, a sensation of weight in the forehead, and attacks of sneezing with rhinorrhœa, dry cough, and, rarely, asthma. Pressure against the septum in some instances may give rise to a considerable amount of pain. This is felt chiefly across the bridge of the nose and over the corresponding nasal bone and also in the supra- and infra-orbital regions. It is occasionally accompanied by a hyper-sensitiveness of the skin to the touch in the same areas. Neuralgic symptoms, however, must not invariably be attributed to pressure of the middle turbinal against

the septum. Other morbid conditions may be responsible for them ; for example, errors of refraction or dental disease. All other sources of neuralgia and allied symptoms should, therefore, be excluded by careful examination and treatment, before attributing them to nasal disease. On the other hand, no case of neuralgia should be given up as incurable until the nose has been examined and the anterior part of the middle turbinate removed if it be in close contact with the septum.

Nasal polypi are accompanied by a very similar train of symptoms, the severity of which will depend entirely on the number of polypi and the gravity of the bone disease. Nasal obstruction and a profuse discharge are perhaps the symptoms most frequently mentioned by the patient. The obstruction may be complete and lead to mouth breathing, with secondary inflammation of the pharynx and larynx, and even the lower parts of the respiratory tract. The discharge may be watery, mucopurulent, or, if suppuration occurs, almost pure pus. The voice assumes a thick nasal quality varying in degree with the amount of obstruction.

Diagnosis.—The objective signs of these conditions are generally sufficient to establish a diagnosis. It is sometimes difficult to decide whether enlargement of the anterior end of the middle turbinal is due to cystic enlargement or bony thickening, but, if either condition is causing symptoms, amputation is indicated, and the doubt can be settled afterwards.

Polypi may have to be distinguished from cysts, from hyperplastic growths in the inferior meatus, and sometimes from malignant disease, tubercle, and syphilis. To distinguish them from *cysts* careful examination with a probe to determine their consistency and mobility should be sufficient, whilst *hyperplastic growths* can be excluded by their origin from the inferior meatus. From *malignant disease* the diagnosis is sometimes difficult, for a malignant growth may be hidden by polypi, and it is only after the removal of the latter that the firm, rough, bleeding, and ulcerated surface of an epithelioma or the soft friable mass of a sarcoma can be discovered. Frequent attacks of epistaxis should arouse the suspicion of malignancy. *Tubercle* is very rare in the ethmoid region, and the ordinary active processes of *syphilis* are not likely to be confounded with polypi ; though often large fleshy granulomata form, which may be mistaken for polypi, and persist after the active process has ceased (p. 149). A polypus in the post-nasal

space must be distinguished from hyperplasia of the posterior ends of the turbinals, from adenoids, and from various forms of new growth springing from the vault or protruding from the posterior choanae. The appearances in the rhinoscopic mirror are usually sufficient, but if there is any doubt it may be necessary to determine the consistency and attachments of the growths by digital examination (p. 16).

Prognosis.—In oedema and thickening of the anterior end of the middle turbinal the prognosis is good, provided efficient treatment is adopted, and in cystic enlargements the prognosis is also good in simple cases uncomplicated with polypi. Not only can the symptoms be relieved, but the morbid condition can be removed without much chance of recurrence. The prognosis of polypi is not so satisfactory. If left untreated they show no tendency to disappear but rather to increase in size and number, and in time they seriously affect the general health, whilst grave complications may ensue. The accessory sinuses may become affected, bronchitis and asthma are of frequent occurrence, and middle ear disease may occasionally be found. One of the chief clinical features of nasal polypi is their tendency to repeated recurrence after removal. This, of course, is explained by the fact that the simple removal of a polypus does not remove the source of disease. The rarefying osteitis of the underlying bone continues and fresh inflammatory oedema of the mucous membrane follows. The prognosis has certainly become more hopeful since the introduction by Lack of a more radical method than had previously been employed of removing, not only the polypi, but the diseased bone as well. After this operation, even if the morbid condition is not entirely cured, the patient is relieved of all the more distressing symptoms, and the general health is greatly improved.

Local Treatment.—In deciding the line of treatment for the various morbid changes occurring in the ethmoid region, their etiology and pathology as described above must be kept constantly in mind. At the cost of repetition let it be stated again that the ethmoid bone is covered by a muco-periosteum, that inflammation of this membrane entails periostitis, that periostitis is almost invariably accompanied by some form of osteitis, and that the various morbid conditions met with in this region are inseparably connected with these bone changes. It is evident that no treatment which is not based on these facts can be considered scientific or rational.

Enlargement of the Anterior End of the Middle Turbinate Bone.—This condition does not always require operative treatment. If, however, symptoms exist which will not yield to simple general and local measures (pp. 211 and 216), the thickened end of the bone must be removed. This is carried out with the snare alone or with the snare combined with cutting instruments such as angular scissors (Fig. 106, p. 220) or cutting forceps (Figs. 115 and 116). Local anaesthesia is, of course, necessary in all cases (see p. 63). The exact method adopted will depend to a great extent upon the shape of the end of the bone and upon the width of the nostril. The difficulty of removing the anterior end with a snare alone lies in the liability of the loop to slip and only bring away a small tag of mucous membrane. It is, therefore, only suitable when the enlarged anterior end projects forwards and downwards and is more or less bulbous in shape, in which case the loop of a snare may be carried round the projecting end, whilst the end of the barrel is held firmly against the anterior extremity of the bone as high up as possible. The wire is then steadily tightened till the parts are severed. If the wire slips, the procedure may be reversed by passing the wire loop over the projecting end of the bone and pressing the barrel against the lower margin of the turbinate, as represented in Fig. 117. This is rendered easier by using a snare with a curved end.

If the enlargement is not bulbous and the nasal cavity is fairly wide, the best method is to cut a deep trench in the bone behind the part to be removed with a pair of cutting forceps, as shown in the accompanying illustration (Fig. 118A). The loop of

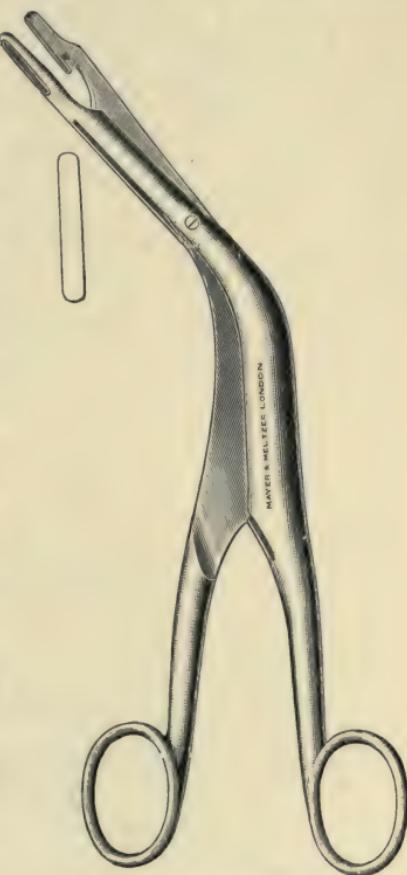


FIG. 115.—Mahu's cutting forceps.

the snare is then placed in this trench, and the barrel is held firmly against the upper part of the anterior end of the bone whilst

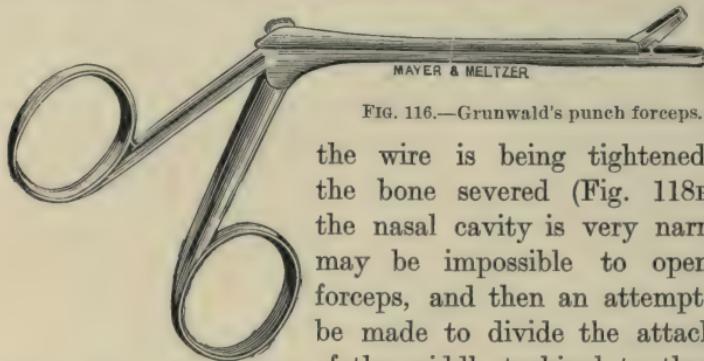


FIG. 116.—Grunwald's punch forceps.

the wire is being tightened and the bone severed (Fig. 118B). If the nasal cavity is very narrow it may be impossible to open the forceps, and then an attempt must be made to divide the attachment of the middle turbinal to the outer

wall with a pair of angular scissors. If this can be accomplished, the loop of the snare is passed into the incision and the end of the barrel is carried backwards along the under surface of the bone as far as may be necessary, and held firmly against it whilst the wire

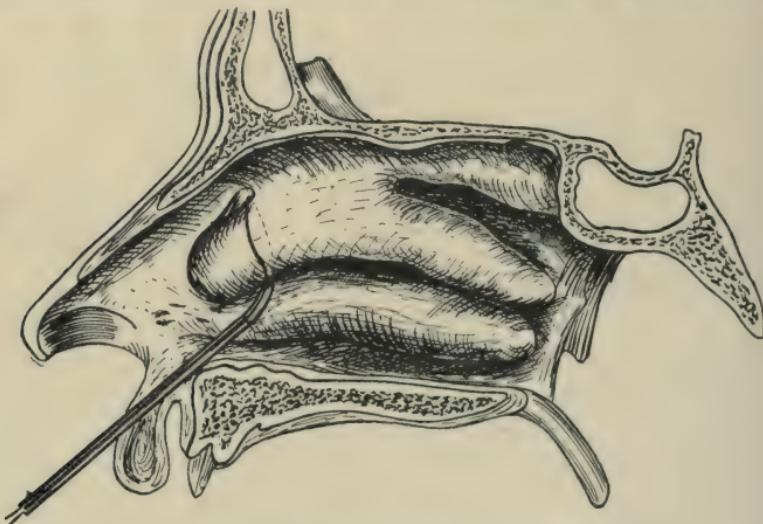


FIG. 117.—Method of removing prominent anterior end of the middle turbinate with a snare.

is then tightened and the bone severed. It is often impossible and always extremely difficult to divide the attachment of the middle turbinal with scissors, so whenever possible cutting forceps should be used in the manner just described. If neither method is successful owing to unusual narrowness of the nose, much may be done to relieve symptoms by gradually removing the anterior end of the bone with punch forceps at repeated sittings.

Cysts of the Anterior End of the Middle Turbinal. — These nearly always require surgical treatment at some time, for they gradually increase in size and cause trouble. The exact method of removal varies with the size of the cyst. Most cysts can be dealt with in every way like an enlargement of the anterior end of the bone. If however they are of considerable size, the anterior part should first be removed with a snare, which will leave a large cavity with thin bony walls, the inside of which is often covered with mucous membrane undergoing polypoid degeneration. This should be left alone for ten days or so, keeping the nasal fossa clean by the use of Collunarium Alkalimum in the meanwhile. Some collapse of the bony walls will occur, when it will be easier to define and deal with the diseased area. In some cases the walls will have shrunk to such an extent that nothing further will be required, but if the cavity in the bone is still large or lined by polypoid mucous membrane, both bone and mucous membrane must be removed with a snare or, if this is impossible, they must be punched away with cutting forceps until healthy tissues are reached. When the cyst has distended the nasal cavity

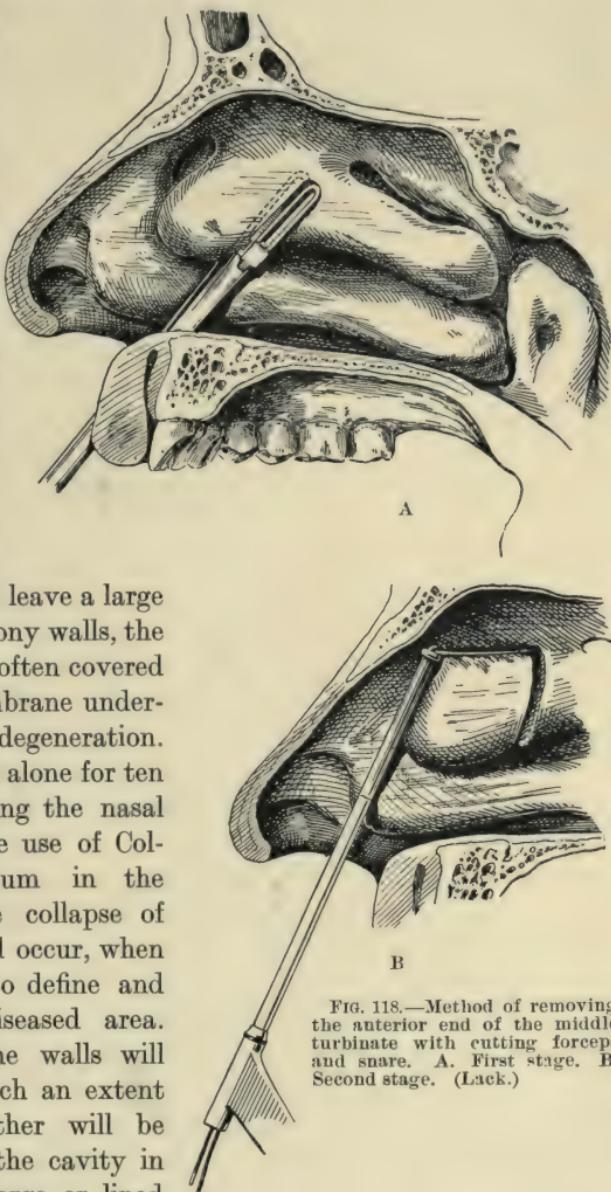


FIG. 118.—Method of removing the anterior end of the middle turbinate with cutting forceps and snare. A. First stage. B. Second stage. (Lack.)

or has become adherent to the septum or outer wall, an attempt may be made to deal with it as above, but it is often impossible to remove even the anterior portion with a snare. Under these circumstances relief may sometimes be given by opening the cyst with cutting forceps, but as a rule a general anæsthetic should be administered, the cyst walls broken down and removed with a curette, and all unhealthy tissues scraped away. Some subsequent "trimming up" is often necessary, which can be done later under cocaine anæsthesia with cutting forceps.

Œdema of the Mucous Membrane covering the Anterior End of the Middle Turbinal.—Though this condition must be regarded as evidence of past or present catarrhal rhinitis, it may exist in slight degrees without causing any inconvenience whatever to the patient, in which case no active treatment is required beyond that for the rhinitis on which it depends (see p. 216). When, however, the œdematosus swelling comes in contact with the septum and causes any of the symptoms mentioned above (p. 229) it should be removed. If there are any evidences that the underlying bone is actively affected, removal of the anterior end of the bone should be carried out by one of the methods already described. If, on the other hand, the bone disease seems quiescent, the œdematosus mucous membrane may be removed alone by means of a snare under cocaine anæsthesia.

The application of the cautery has been recommended for reducing these œdematosus swellings, but seeing that the inflammatory reaction after its use spreads beyond the limits of the original wound, there is considerable risk of starting a fresh centre of periostitis and osteitis and so of increasing the œdema. In addition to this, deep cauterisation of the middle turbinal is not without danger (p. 34). Removal with the snare is, therefore, the better method.

In all the operations described above for treatment of morbid conditions of the middle turbinated body, the necessary manipulation will be greatly facilitated by the addition of supra-renal extract to the cocaine solution (p. 63) used for the induction of local anæsthesia, so that the field of operation may be kept free from blood until each step is accomplished. It is both unnecessary and inadvisable to cut through the structures to be removed in the gradual manner recommended for the inferior turbinal. It is unnecessary because there is not the same vascularity in the middle turbinal, and inadvisable because operations

in this region are very much more painful, and therefore the quicker they are carried out the better for the patient. In cutting through bone, it must be entirely divided with the snare and on no account pulled or torn away, which, if the bones are brittle, might lead to injury of the cribriform plate. Snares for these operations should be strong in themselves and constructed so as to carry strong wire, and they should work smoothly and quickly. Lack's (p. 221) or Krause's (p. 238) snares answer these requirements very nicely.

The after-treatment of intra-nasal operations has already been fully discussed in Chapter iii. p. 70.

Treatment of Nasal Polypi.—The treatment of nasal polypi will depend on the active progress or quiescence of the bone disease. It is not always easy to determine the exact condition by the appearances within the nose. It may, however, be definitely stated that if suppuration is present, or if the polypi are very numerous and the mucous membrane surrounding their attachments is oedematous, the bone disease is sure to be active. If, on the contrary, there is no suppuration and only one or two polypi, the attachments of which are surrounded by healthy mucous membrane, there is a strong probability, but not a certainty, that the underlying bone has become sclerosed, and that all active changes have ceased. In the latter case simple removal of the polypus is sufficient and should be adopted. In the former case simple removal is sure to be followed by recurrence, and therefore can only be looked upon as palliative and temporary. Radical treatment must include the removal of the underlying diseased bone.

(1) **Simple Removal.**—The method of carrying this out depends on whether the polypi are situated (a) in the nasal cavities, or (b) in the post-nasal space.

(a) *Removal of Polypi within the Nasal Cavities* is best effected by means of a snare. Polypus forceps used to be much employed and still may be of service occasionally when used under a good illumination to pick off small oedematous masses, which cannot be easily encircled in a snare, but even under these circumstances punch forceps are better. The old method of inserting forceps into the nose without illumination and pulling out anything that might come within their grasp is unscientific, extremely painful, and not without danger. There is a great variety of snares, all of which are quite suitable for the removal of simple polypi.

Lack's (p. 221), Mackenzie's (p. 222), Badgerow's modification of Blake's (Fig. 119), and Krause's (Fig. 120) may be mentioned. Each pattern requires slightly different manipulation, and it is advisable to select two of them and become thoroughly conversant

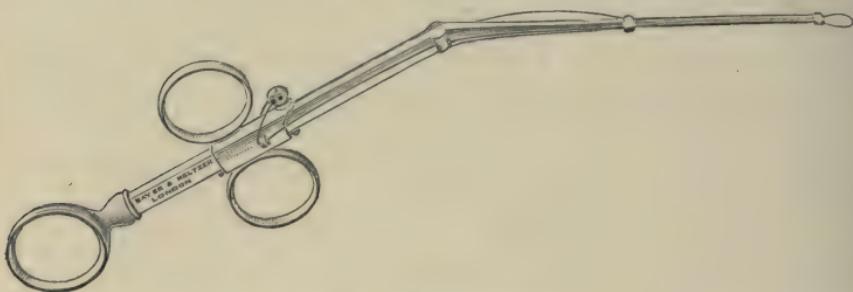


FIG. 119.—Badgerow's snare.

with their use, for in this way the quickest and best work can be done. Lack's and Badgerow's may perhaps be specially recommended ; Lack's because it serves so many useful purposes (p. 220), and Badgerow's because it is rapid in its action, easy of manipulation, and quickly cleaned. Mackenzie's is also easily manipulated, but it is noisy, complicated, and difficult to clean. Two or three

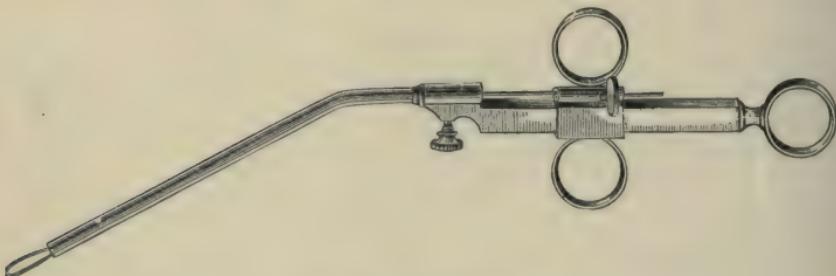


FIG. 120.—Krause's snare.

snares of the selected pattern are cleansed by boiling and placed ready for use in a bowl of boracic lotion.

Local anaesthesia is then induced by packing pledgets of cotton wool soaked in cocaine solution round the polypi and especially round their attachments. When this is not possible owing to lack of room a little 10 per cent. solution of cocaine may be cautiously sprayed into the nose. Care, however, must be taken that the patient does not swallow any of the solution (p. 62). After about ten minutes the pledgets of wool are withdrawn and a good light is concentrated through a nasal speculum into the nose. The snare is then intro-

duced, with the loop sideways, along the outer or inner wall of the nose, keeping the lower border of the loop on the floor of the fossa. The operation is generally simplified by passing the loop between the polypus and the outer wall, for then there is no chance of its being caught beneath the inferior turbinal when turned round to ensnare the polypus. If, however, there is a prominent spur attached to the septum just above the floor of the nose, it may be easier to engage the polypus by passing the snare along the septum. The loop is passed backwards until its further end is well behind the polypus, when the lower border is gently insinuated beneath it, and carried upwards towards its pedicle. Whilst this is being done the loop should be diminished in size. When the snare has been worked upwards as far as seems possible towards the attachment of the polypus, it should be quickly tightened until the pedicle is firmly grasped, taking care whilst doing this not to withdraw the snare from the nose. The pedicle may now be divided by slowly tightening the wire, or the polypus may be torn out by a short, sharp pull. The latter method is on the whole the better, because if the wire happens to have grasped the pedicle somewhat below its actual attachment, the portion above the wire is usually pulled off and so the whole growth is removed. Moreover, in cases where there are more polypi than one, others may be pulled out with the one ensnared. Pulling, however, causes a considerable amount of momentary pain.

As a rule, in such cases as are suitable for simple removal, one nostril can be completely cleared out at the first sitting. It is, however, a matter of common observation that in some individuals, especially elderly people, the removal of polypi is followed by very appreciable, and sometimes severe shock and exhaustion. Care should, therefore, be taken not to do too much at a time. As a rule the haemorrhage is easily arrested by sniffing cold alkaline lotion (p. 29) up the nostril, but if it continues some gauze may be packed round the wound for a few minutes and then removed. Finally a small piece of cotton wool should be inserted into the nostril and worn for the rest of the day. The patient must afterwards keep the nasal cavity clean by sniffing alkaline lotion up the nostrils night and morning until healing is complete. (For further details of after-treatment, see p. 70.)

If it has not been possible to clear the nostril at the first operation, the above procedure should be repeated after a week's

interval, and if both nostrils are involved, the second one must be cleared on a subsequent occasion.

The result of this operation is very satisfactory if there is no active bone disease. As a rule no recurrence takes place and the patient is permanently cured. As, however, it is never possible to determine the condition of the underlying bone absolutely, the patient should be kept under constant observation, and, if there is recurrence, the case must be dealt with as hereinafter described for localised bone disease with polypi.

(b) *Removal of Polypi in the Post-Nasal Space.*—A so-called post-nasal polypus is generally single, of long standing, and unaccompanied by active bone disease, so that with its removal the pathological process comes to an end. They generally spring from the posterior part of the middle turbinal, and sometimes attain a great size and protrude from behind the soft palate into the oro-pharynx. The method of their removal depends to some extent upon their size. If they are of medium size and only just protrude into the post-nasal space, it is usually possible to remove them with a snare under good illumination through the anterior nares. The nasal passage is rendered as patent as possible by the application of cocaine and supra-renal extract, and then the snare is passed well back in the manner above described and guided if possible round the polypus. The wire having been tightened, the polypus is cut or torn out.

If this method fails, or if the polypus is larger in size, nitrous oxide gas must be administered, and the left forefinger introduced into the post-nasal space through the mouth, in order to define the pedicle of the polypus. A long pair of polypus forceps is immediately introduced along the floor of the nose until the points of the blades come into contact with the finger, which then guides the pedicle between the opened blades of the forceps. The polypus is firmly grasped and torn from its attachment by a twisting, pulling movement, and withdrawn through the anterior nares.

This method as a rule is quick and easy of performance, but some surgeons prefer to remove post-nasal polypi with a snare. A longer anaesthesia must in this case be induced by the administration of gas and ether or A.C.E., and a snare with a large loop is passed through the anterior nares until the loop appears in the mouth. The index finger of the left hand is then introduced through the mouth and the loop guided round the polypus. The snare is

then withdrawn from the nose until arrested by the resistance of the growth, when the wire is tightened until the pedicle is firmly grasped. The pedicle of the polypus is now divided by gradually tightening the snare, or it can be torn from its attachment.

If the polypus is so large as almost entirely to block the post-nasal space, or if more than one polypus is present, it may be impossible to pass a snare with a large loop through the nose into the mouth. Under these circumstances the snare should be threaded with a long length of wire which is drawn through the barrel until only a small stiff loop is left protruding, whilst the proximal ends are left unfixed to the snare. Thus threaded the snare is pushed through the nose into the post-nasal space; and the index finger, passed behind the palate, catches the wire and pulls it forward into the mouth. The loop is then opened widely and guided over the polypus, and the wire is withdrawn through the barrel of the snare until it is felt that the growth is within its grasp. The wire is next attached to the snare in the usual way and gradually tightened until the polypus is severed.

After removal of a post-nasal polypus Collunarium Alkalimum (p. 29) should be used night and morning for ten days, and the patient must be inspected from time to time to see that there is no recurrence.

(2) *Removal of Polypi with the Underlying Bone.*—Here again the procedure differs according as the disease is (a) strictly localised, or (b) widely distributed in the ethmoid bone and its cells. In both cases the success of the treatment depends upon the removal not only of the polypi, but also of all traces of diseased bone.

(a) *In Localised Disease* the procedure is much the same as in simply removing polypus, only every effort must be made to include within the grasp of the snare the portion of bone to which the polypus is attached. The bone must be cut through and on no account wrenched off for fear of a fracture spreading to the cribriform plate. If the bone cannot be included within the loop of the snare, the nose should be cleared of polypi and the removal of the diseased bone undertaken on a subsequent occasion. If the anterior portion of the middle turbinal is the chief seat of disease its amputation must be undertaken. The methods of performing this operation have already been fully described (p. 233). If the disease is in the region of the uncinate process or bulla ethmoidalis, the bone should be nibbled away by means of cutting forceps. Generally

previous amputation of the anterior end of the middle turbinal is necessary in order to gain access to these parts. For all these manipulations local anaesthesia is of course necessary (p. 63). Finally, if it is impossible to remove the whole of the diseased tissues by means of cutting forceps, nitrous oxide gas should be administered to the patient in the sitting posture, and, a good light having been thrown into the nostril, the diseased area is thoroughly curetted with a ring knife. For the after-treatment, see p. 70.

(b) *Extensive Bone Disease with Multiple Polypi.*—In cases where it is evident that the disease is widely distributed, or where there are many polypi accompanied by suppuration, the above operations are insufficient, and even if the nose is thoroughly cleared, rapid recurrence usually takes place. The choice, therefore, lies between repeated removals with a snare, followed by the use of



FIG. 121.—Meyer's ring knife.

cutting forceps and slight curettements under cocaine anaesthesia, or the performance of a radical operation. Although it is not perhaps at present generally admitted, there is little doubt that the radical operation designed and advocated by Lack is the best course to pursue in suitable cases. It consists in the thorough removal of all diseased tissues by means of a ring knife under a general anaesthetic, and is indicated in cases of multiple polypi with extensive disease of the ethmoid bone, especially when accompanied by suppuration ; and also in cases where simpler measures have failed. It is contra-indicated in patients over fifty years of age and should only be undertaken with caution in those over forty-five years. It is carried out thus : The patient is placed in the recumbent position on the operating table with the head slightly raised ; a general anaesthetic is administered and carried to a point short of abolishing the swallowing reflex. The patient's head is turned towards his right side and the operator stands on the right of the patient. If the nose is much blocked with polypi a strong light is thrown into it through a speculum, and the bigger polypi are seized with polypus forceps and pulled from the nose. The nasal cavities are then carefully examined with a finger both from the anterior nares and the post-nasal space, and the amount of

disease determined as far as possible. If the middle turbinate is found to be present and firm, it should be removed with a spoke-shave, which is passed between it and the septum, hooked over the posterior end, and then sharply withdrawn. Often the middle turbinal has been disintegrated and absorbed in the process of the disease or has become so much softened that it comes away by scraping. A large Meyer's ring knife (Fig. 121) is then introduced into the nose with the cutting edge facing outwards towards the orbit, and passed upwards and backwards to the ethmoid region. The whole of the lateral part of the ethmoid is rapidly scraped away, the scraping being continued until no more soft friable tissue can be removed, and until healthy bone is reached. Healthy bone can be recognised by its firm surface and by the fact that it resists the ring knife. In the course of this scraping it is astonishing what masses of polypi, degenerated mucous membrane, and fragments of bone will come away. Every now and then the finger is introduced to see if any soft pulpy degenerated tissue can be felt, and the scraping must be continued until all this has been removed. The bleeding is very profuse, and therefore directly the operation is finished the patient should be turned well over on to his side so that the blood may run out from the nose and not get down the throat. As a rule it quickly stops on the application of cold water to the face, but it may sometimes be necessary to pack the nostril with strips of gauze (see p. 72). Packing should not be resorted to unless absolutely necessary, because it causes much discomfort to the patient, and may be followed by septic troubles, infection of a sinus, and renewed haemorrhage on its removal. If this operation is thoroughly performed, no polypi can well be left, all the ethmoidal cells are opened up and degenerated mucous membrane lining then scraped away, and all diseased bone is removed.

The after-treatment consists in keeping the nose clean by the use of some mildly antiseptic detergent lotion, such as the alkaline, sanitas, or boro-glyceride nasal washes (see p. 29), its use being commenced about forty-eight hours after the operation. Occasionally it may be necessary afterwards to remove small loose fragments of bone or tags of mucous membrane, and a careful watch should be kept for the formation of adhesions, which are very apt to occur. By prompt measures they can generally be prevented (see p. 29). Very often oedematous granulations will make their appearance in the upper part of the nose after a few

days. As a rule these cause no discomfort, do no harm, and tend to disappear of themselves, and should therefore be left alone. If they become very big and persist they can be removed later with a snare. Serious recurrences are rare after this operation in all but the very worst cases; sometimes a little suppuration may continue and a little true polypus formation occur, but the patient is never in the same distressed condition as before the operation. Small recurrences can generally be dealt with by means of a snare and ring knife under cocaine anaesthesia. It must be borne in mind that the pus may come from the frontal or maxillary sinuses, in which case appropriate treatment must be adopted.

This operation having been recently introduced it is necessary to inquire if there are any special dangers connected with it. Three members of the staff of the Throat Hospital have now performed it with sufficient frequency (over 300 times) to demonstrate that in careful hands it can be carried out without serious complications. The great risk is that of wounding of the cribriform plate with subsequent meningitis. This danger is reduced to a minimum by always keeping the ring knife facing *outwards* and working *outwards* towards the orbital plate and *never* upwards. It is not an operation, however, that should be undertaken by surgeons unaccustomed to intra-nasal work. Two or three deaths from meningitis have been recorded, whilst amongst the less serious complications may be mentioned slight septic absorption with rise of temperature, haemorrhage into the orbit, acute otitis media, and adhesions. Lack also records one case of orbital abscess with necrosis of the inner wall of the orbit, but the patient eventually made a good recovery.

In patients over forty-five or fifty years of age or in very debilitated subjects, an attempt must be made to relieve, and possibly eventually to cure, the condition by a prolonged series of smaller operations. The polypi should be removed and as much as possible of the diseased bone punched away with cutting forceps. In some cases, however, the patient's health so deteriorates from the worry and anticipation of these repeated operations that it seems better to give up the attempt at a cure, and only do sufficient to keep the nostril fairly patent and the patient comfortable.

Great stress has in the past been laid upon the application of galvano-cautery to the site of origin of a polypus in order to prevent recurrence. The procedure, however, cannot be recom-

mended. If there is underlying bone disease, it would be dangerous to attempt to destroy the diseased area by burning, and even if it were possible to do so without danger, the irritation caused thereby would be extremely likely to set up a periostitis and osteitis in the neighbouring area, and so lead to recurrence of polypi. If there is no bone disease the cautery is absolutely unnecessary and can do nothing but harm.

CHAPTER X

CHRONIC INFLAMMATORY AFFECTIONS OF THE NOSE (*continued*)

CHANGES AFFECTING THE ACCESSORY SINUSES OF THE NOSE

ANATOMY. MUCOCELES: Nature and Treatment. ACUTE INFLAMMATORY AFFECTIONS: Etiology, Pathology, Symptoms, and Treatment. CHRONIC SUPPURATION: *Etiology—Pathological Changes—Symptoms:* (i) Of Sinus Suppuration generally, (ii) Of the Set of Sinuses involved, (iii) Of the Particular Sinus involved—*Complications—Diagnosis—Exploration and Treatment:* (i) Of the Antrum, (ii) Of the Anterior Ethmoidal Cells, (iii) Of the Frontal Sinus, (iv) Of the Sphenoidal Sinus, (v) Of the Posterior Ethmoidal Cells.

In this chapter three distinct affections must be considered:—

- I. Mucoceles.
- II. Acute Inflammation.
- III. Chronic Suppuration.

Before proceeding to discuss these in detail, a few words must be said about the anatomical distribution of the various sinuses which surround the two nasal cavities, and of their openings into the nose; for a knowledge of these points is essential to the clear understanding of the etiology, pathology, and treatment of diseases of the sinuses.

ANATOMY

Each of the nasal passages is subdivided by the three turbinated bodies into four channels or meatuses, running in an antero-posterior direction (Figs. 122 and 123). The inferior meatus runs between the floor of the nose and the lowest turbinal, and receives the opening of the nasal duct. The middle meatus lies between the inferior and middle turbinals, and the superior between the middle and superior turbinals, whilst the fourth or uppermost meatus lies between the superior turbinal and the cribriform plate. The middle turbinal hides from view several important structures on the outer wall of the nose. In the first place, there is the uncinate process, a ridge of bone which runs downwards and back-

wards nearly to the posterior end of the middle meatus. Above the uncinate process is the bulla ethmoidalis, a projection caused by one or more of the middle ethmoidal cells, and between the

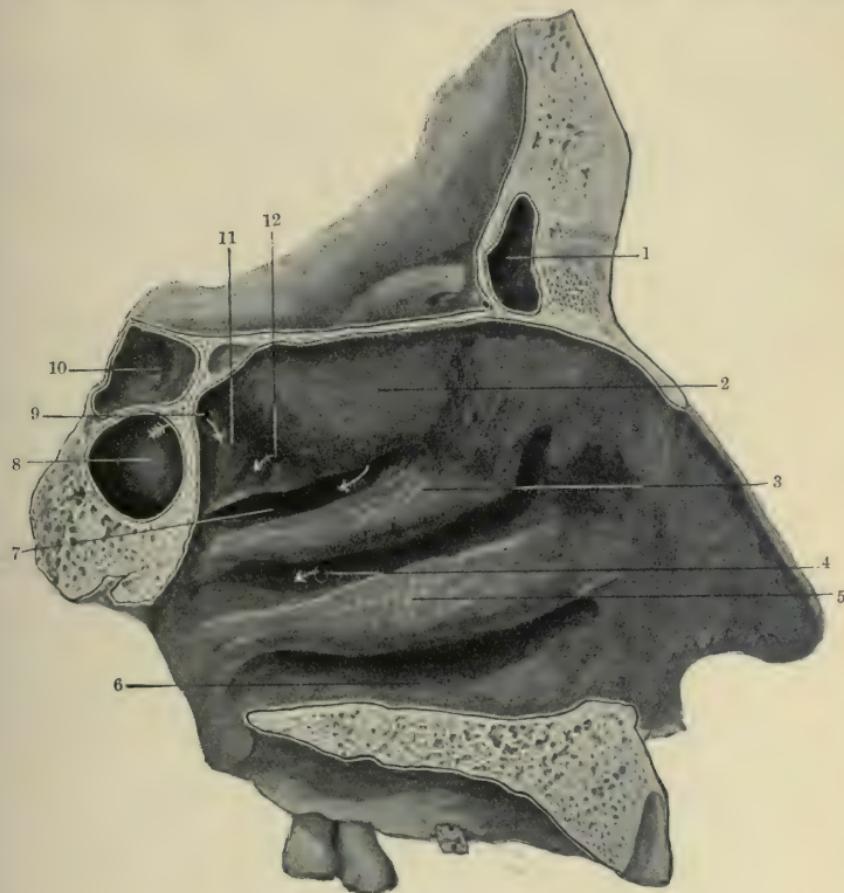


FIG. 122.—Outer wall of the left nasal cavity. (Logan Turner)

1. Frontal sinus.	7. Superior meatus.
2. Superior turbinate body.	8. Right sphenoidal sinus.
3. Middle turbinate body.	9. Sphenoidal ostium.
4. An accessory maxillary ostium.	10. Left sphenoidal sinus.
5. Inferior turbinate body.	11. Spheno-ethmoidal recess.
6. Inferior meatus.	12. Ostium of a posterior ethmoidal cell.

uncinate process and the bulla ethmoidalis is the hiatus semilunaris, into which many of the accessory cavities open (Fig. 124).

The accessory sinuses form a nearly continuous chain along the outer side of each nasal fossa, and from a clinical point of view may be divided into two groups according as their openings are below or above the middle turbinal. In the first group are the frontal, the fronto-ethmoidal, and the anterior ethmoidal cavities

and the maxillary antrum; and in the second group are the posterior ethmoidal and the sphenoidal cavities (Fig. 125). The frontal sinus and the fronto-ethmoidal cells open into the infundibulum, and thence into the hiatus semilunaris; the anterior

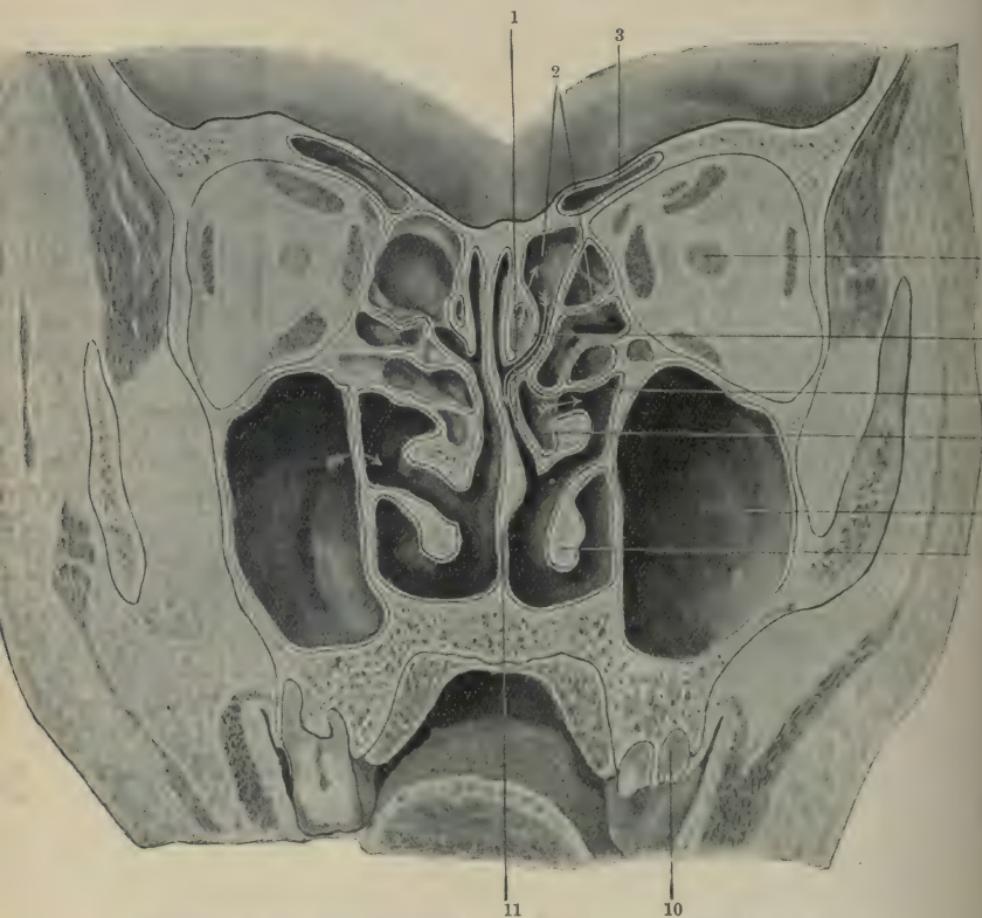


FIG. 123.—Vertical coronal section of the skull on the plane of the first molar teeth, viewed from in front. (Logan Turner.)

1. The olfactory cleft.	6. Middle meatus.
2. Posterior ethmoidal cells.	7. Cell in the middle turbinal.
3. Frontal sinus.	8. Maxillary antrum.
4. Optic nerve.	9. Inferior turbinal.
5. Posterior ethmoidal cell.	10. Molar tooth.
11. Nasal septum.	

ethmoidal cells and the maxillary antrum open direct into the hiatus semilunaris; whilst the posterior ethmoidal cells open into the superior meatus, and the sphenoidal into the fourth meatus.

The relative position of the ostium to its sinus is also very important from a clinical standpoint. In some instances it is

at the most dependent part of the cavity, thus aiding natural drainage, whilst in other instances it is nearly or quite at the uppermost part. When the ostium is at the upper part of the cavity, the emptying of the sinus depends entirely on the action of the ciliated

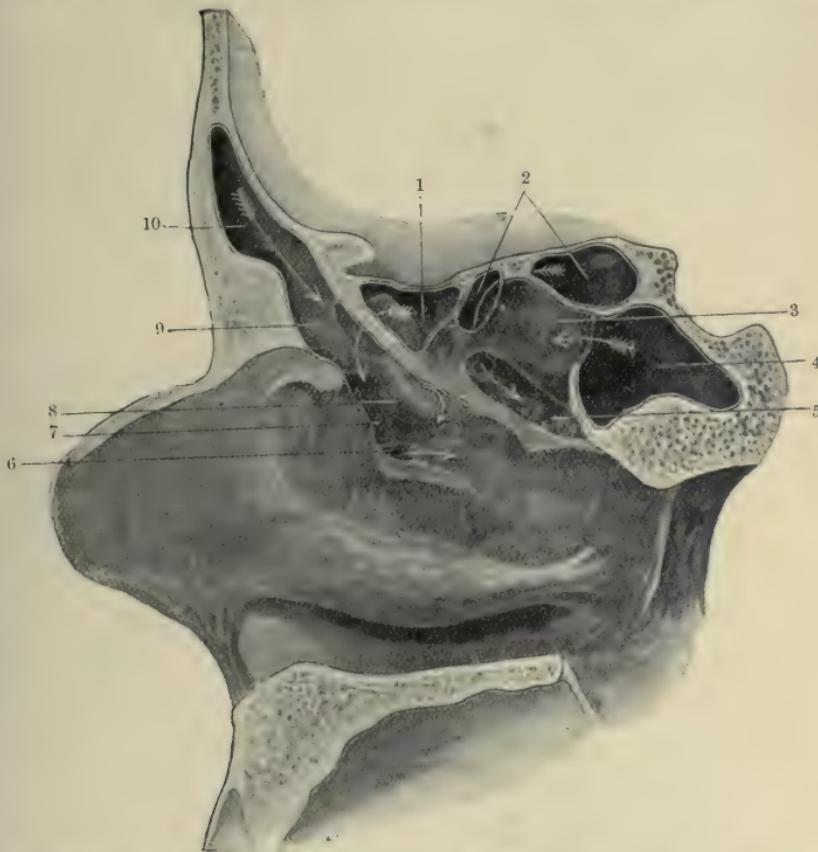


FIG. 124.—Dissection showing the outer wall of the right nasal chamber after removal of the superior and middle turbinated bodies. The uncinate process has been turned down, so as to expose the ostium maxillare at the bottom of the infundibulum. (Logan Turner.)

1. Anterior ethmoidal cells.	6. Ostium of maxillary antrum.
2. Posterior ethmoidal cells.	7. Infundibulum.
3. Spheno-ethmoidal recess.	8. Bulla ethmoidalis.
4. Sphenoidal sinus.	9. Fronto-nasal duct.
5. Superior meatus.	10. Frontal sinus.

epithelium which lines the cavities. The cilia work towards the ostium, and if these are damaged or destroyed by morbid processes, natural drainage becomes impossible. In the frontal sinuses the openings are at their lowest part ; those of the fronto-ethmoidal cells are generally at the top ; those of the anterior ethmoidal cells vary ; and those of the maxillary antra are always high up on their inner walls. The openings of the posterior ethmoidal cells also vary

considerably. In some skulls each cell has a separate opening which may be either at the top or at the bottom of the cavity,

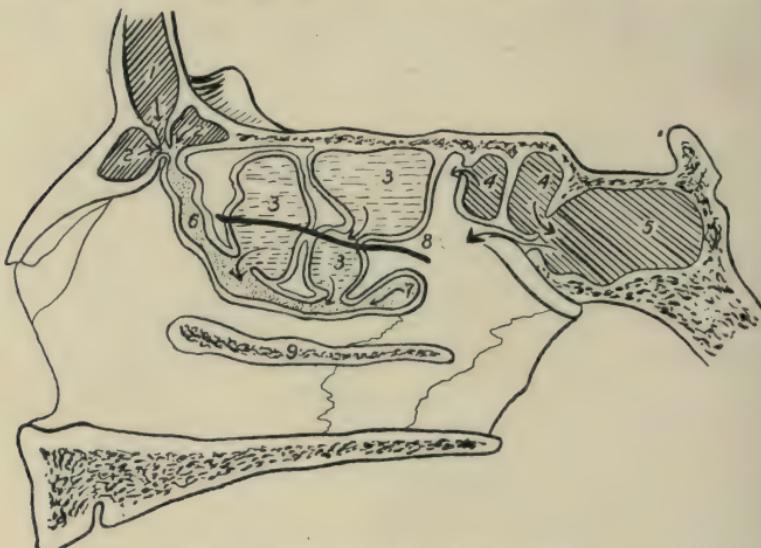


FIG. 125.—Diagram of the accessory sinuses.

1. Frontal sinus.	5. Sphenoidal sinus.
2. Fronto-ethmoidal cells.	6. Infundibulum.
3. Anterior ethmoidal cells.	7. Ostium of maxillary antrum.
4. Posterior ethmoidal cells.	8. Attachment of middle turbinal.
9. Attachment of inferior turbinal.	

and in other skulls some of the cells open into each other, whilst occasionally one or more of them may open into the sphenoidal sinus. The opening of the sphenoidal sinus is almost invariably high up in the anterior wall (see Fig. 122).

I. MUCOCELES OF THE ACCESSORY CAVITIES OF THE NOSE

Mucoceles, or distension of an accessory cavity with mucous fluid, are decidedly rare. The cell in the anterior end of the middle turbinate is most frequently affected, the ethmoidal cells and frontal sinuses come next, whilst a collection of mucus within the antrum sufficient to cause bulging of its walls is exceedingly rare (Logan Turner).

Etiology.—Mucoceles occur with equal frequency in either sex, and are commonest during adolescence. The retention of fluid within the sinus is due to blocking of the ostium, and this in its turn is almost always due to swelling of the surrounding mucous membrane consequent on acute or chronic rhinitis. Occasionally it

is due to trauma, and possibly in rare instances to congenital absence of the natural opening. Probably some cases of acute and chronic suppuration of the sinuses start as mucoceles, which afterwards become infected with pyogenic organisms.

Pathological Changes.—The appearances of cystic enlargements of the anterior end of the middle turbinal have already been described (p. 227). Mucoceles of the ethmoidal cells may, in rare instances, cause bulging inwards of the outer wall of the nose, but more often the appearances within the nose remain normal, whilst bulging of the inner wall of the orbit with displacement of the eyeball outwards and downwards takes place. In the former case one of the anterior cells is usually affected, most frequently the cell of the bulla ; in the latter one of the posterior cells. Later, the distended body wall of the cyst may give way, and be replaced by a soft fluctuating swelling.

When the frontal sinus is affected there is gradual distension of its walls, especially marked at the inner angle of the orbit. The bone gradually yields, the swelling becomes fluctuating, and the eyeball is pushed downwards, outwards, and slightly forwards.

As already stated expansion of the antral walls is exceedingly uncommon from this cause. In rare instances the inner wall may bulge causing some nasal obstruction, or the roof may expand causing displacement of the eye upwards.

The retained fluid is usually clear yellow, but it may be turbid and brown, or flaky and yellow. In a case described by Logan Turner it was likened to brain matter. The bony walls are thin, and in long-standing cases deficient. The mucous membrane lining the cavity is also thin and devoid of cilia.

Symptoms.—Mucoceles of the middle turbinal cell, and of the ethmoidal cells with intra-nasal bulging, cause nasal obstruction and sometimes pain characteristic of pressure of the middle turbinal against the septum (p. 229). Mucoceles of the frontal sinuses and the ethmoidal cells with external distension are characterised by a gradually progressive swelling unaccompanied by pain or tenderness on pressure. So little inconvenience of any sort is experienced that it is often many years from the first appearance of swelling before advice is sought. In the same way mucoceles of the antrum with bulging of its walls produce no subjective symptoms, but when no bulging takes place there may be some pain and discomfort indefinitely resembling empyema of the antrum.

Diagnosis.—When the affected sinus bulges into the nasal fossa, careful examination with a probe should render the diagnosis from polypi and malignant disease easy, but when the eye is displaced or external swelling occurs malignant growths must be carefully excluded. The absence of pain and the very slow progress of the deformity point to mucoceles.

Treatment.—The treatment of mucocele of the *middle turbinal* has already been dealt with under cystic enlargements of the anterior end of middle turbinal (p. 233).

When a mucocele of the *anterior ethmoidal cells* bulges into the nasal cavity, a free opening must be made and the fluid evacuated. It is often possible to do this, after the application of cocaine and supra-renal extract, by means of a snare, and later the opening thus made can be further enlarged with cutting forceps. If this is not possible, the cell must be opened with a burr or curette. When the ethmoidal cells are distended into the orbit, the only satisfactory method of dealing with them is by external operation. An incision following the line of the eyebrow and extending on to the side of the nose is made over the swelling, the cyst freely opened, and free drainage into the nose established and maintained on the lines suggested under chronic suppuration of the ethmoidal cells (p. 283).

When the *frontal sinus* is affected external operation is again the only method. If the sinus is small obliteration should be aimed at. The method of performing this operation is precisely the same as for chronic suppuration (p. 291) except that in mucocele it is not always necessary to enlarge the infundibulum and establish free drainage into the nose, though occasionally external drainage should be maintained for a few days by the insertion of a fine strip of gauze into the sinus. If the sinus is greatly distended, it is impossible to obliterate it, in which case it must be freely opened, and drained both into the nose and externally. The method of performing this operation is also described under chronic suppuration (p. 290).

In suspected mucocele of the *antrum*, the first step is to confirm the diagnosis by an exploratory puncture through the inferior meatus (p. 273). After introducing the trochar it is better, in the first instance, to try and drive the mucus out with an air douche rather than to wash it out, because the presence of the mucus may be overlooked when mixed with water. This, however, may be difficult if the ostium is firmly blocked, and water may be

required to force the opening. The diagnosis being confirmed the case must be treated on the same lines as recent empyema of the antrum. A few irrigations through the inferior meatus with a trochar and cannula may be tried. If this is not sufficient a permanent opening is made either through the alveolar border or through the inferior meatus, preferably the latter, and the antrum daily irrigated. If all other methods fail the radical operation, as recommended for chronic suppuration, must be performed. (For methods of performing these operations, see pp. 269 to 281.)

II. ACUTE INFLAMMATORY AFFECTIONS OF THE ACCESSORY CAVITIES

Definition.—An acute inflammation of the mucous membrane lining the accessory cavities of the nose accompanied by alteration, and sometimes retention, of the secretions.

Etiology.—Under this heading, not only the causes of the inflammation itself, but also those of retention and suppuration must be considered.

1. Causes of the Inflammation.—In the great majority of instances, acute inflammation of a sinus is an extension of acute rhinitis. As already seen, acute rhinitis is very common amongst those suffering from chronic rhinitis. The causes of acute and chronic rhinitis are, therefore, the causes of acute sinusitis. The sinuses are, however, especially likely to become involved when the acute rhinitis is due to one of the acute specific fevers, particularly influenza. Amongst other causes may be mentioned atrophic rhinitis (p. 309), syphilitic caries or necrosis, tubercle, malignant disease, injuries, the presence of foreign bodies, and septic infection following the application of the electric cautery and other intra-nasal operations, especially if it has been necessary to plug the nose. Again, one sinus is sometimes infected from another, and the maxillary antrum in quite a large proportion of cases is infected by carious teeth or periodontal suppuration.

2. Causes of Retention.—Though catarrhal inflammation of the mucous membrane of one or other of the sinuses is probably fairly common in the course of acute rhinitis, retention of the discharges producing symptoms of distension is comparatively rare. Occlusion of the openings of the accessory cavities and complete retention of the discharges may be due to swelling of the surrounding mucous membrane alone, but it more often occurs when, added

to this, the nasal cavities are unusually narrow; when polypi, enlargement of the middle turbinal, or deviation of the septum are present; or when there is permanent thickening of the mucous membrane due to chronic rhinitis. Finally, in those sinuses in which the natural opening is situated in the upper part of the cavity, paralysis of the cilia from the severity of the inflammation may be a contributing cause.

3. Causes of Suppuration.—Again, it is not in every case of acute sinusitis that the discharges become purulent; but they may frequently do so when the patient is debilitated in health, or convalescent from one of the acute specific fevers, especially influenza, and when complete or even partial retention of the discharges occurs from any of the above causes.

Pathological Changes.—In cases of simple acute catarrh of the accessory sinuses without retention or suppuration, the intra-nasal changes are simply those of acute rhinitis. There is turgescence of the vascular tissue of the inferior meatus, and oedematous swelling in the ethmoid region, with intense redness of the whole mucous membrane. If retention occur, marked oedema of the middle turbinate and outer wall of the nose will usually be observed, and if the antrum or ethmoidal cells are involved there may be bulging of their inner walls into the nose. Externally redness, swelling, and oedema over the affected sinus, possibly with bulging of the bony wall, may occur. If suppuration occur pus will escape and find its way into the nose or post-nasal space, unless the ostium is entirely blocked.

Symptoms.—In the course of acute rhinitis it is probable that one or other of the accessory sinuses is often implicated, but the symptoms are not marked unless the discharges are retained. The sense of heaviness over the eyes and dull aching in the supra-orbital region, which are so common in ordinary "colds in the head," are probably due to catarrhal inflammation of the frontal sinus or the anterior ethmoidal cells. The symptoms of other sinuses being involved are too indefinite to lead to a diagnosis, though Watson Williams says that a sense of fulness and indefinitely localised headache with pain and discomfort in the cheek may be due to sphenoidal sinus catarrh, whilst dental neuralgia may arise from acute catarrh of the ethmoidal and maxillary sinuses.

If in the course of catarrhal inflammation of a sinus its opening becomes blocked, a fresh and more definite train of symptoms

follow. There is nasal obstruction accompanied by great pain and a feeling of fulness in the nose, and acute pain of a throbbing or lancinating character in and over the affected sinus, together with a most distressing sense of distension, which is greatly increased by exertion of any kind. Tenderness is felt on pressure or percussion in the supra-orbital region and at the inner angle of the orbit when the frontal or fronto-ethmoidal cells are affected, and over the nasal bone and malar prominence when the maxillary antrum is affected. Headache, generally limited to the side affected and chiefly supra-orbital, is a common symptom, whilst intense neuralgia along one or more branches of the trigeminal nerve is not unusual.

In very severe cases, especially when the retained secretions become purulent, still further symptoms may be added, such as malaise, rise of temperature, and loss of appetite, with local redness, swelling, oedema, pain, and tenderness.

If the condition is left untreated all symptoms increase in severity for a period lasting from some hours to two days, when the pressure of the accumulated fluid within the sinus forces an exit through the natural opening and all symptoms are suddenly relieved by a gush from the nose of mucus, muco-pus, or pus, often mixed with blood. Recovery may now take place, or the same series of symptoms may recur.

Prognosis.—Though the above is the usual course of acute inflammation of a sinus, and though complete recovery is the rule, grave results may sometimes supervene. The fluid within the sinus may fail to force the natural opening and an acute abscess of the cavity result. The fluid may burst through the bony walls and lead to an abscess around the sinus or to cerebral complications. Septic infection may also be carried through the lymph channels or veins and cause meningitis, extradural abscess, cerebral abscess, sinus thrombosis, or cellulitis in the orbital fossa. Finally, acute inflammation is often the origin of chronic suppuration of a sinus (p. 259).

Diagnosis.—Careful attention to the history of the case and to the symptoms and course of the affection should render the diagnosis easy.

Treatment.—Prompt treatment in all cases of acute inflammation of the sinuses is of importance, for the sooner the process is arrested, the less are the risks of subsequent chronic suppuration and other complications. The indications are to cut short the

acute rhinitis, to relieve the pain, and, should there be retention of discharges, to obtain evacuation of the involved sinus as early as possible. The measures which may be employed for checking an acute catarrh of the nose have already been discussed (p. 192). Supposing, however, such measures have been neglected and that in the course of acute rhinitis there is a sudden onset of pain in or over a sinus, the patient should at once be confined to bed in a warm room and a diaphoretic mixture (p. 192) administered. The bowels should be freely opened by means of five grains of calomel followed by a dose of *Mistura Alba* (p. 59). The diet must be light, and all alcohol avoided, as it causes further congestion of the blood-vessels and increased pain. Locally the swelling of the mucous membrane is reduced by spraying the nasal cavities with the nebula of menthol and cocaine (p. 44), then washing them with warm compound menthol collunarium (p. 48), and finally by the inhalation of the vapour of compound tincture of benzoin (p. 52). These applications are repeated every two or three hours. They help materially to relieve the pain, and encourage the free escape of secretions from the sinuses. Pain may be further relieved and congestion reduced by the application of moist or dry heat over the bridge of the nose, and over the affected sinus. If the pain is very severe eight grains of aspirin given in a capsule and repeated in four hours' time, if necessary, will usually relieve it.

Directly there are symptoms pointing to retention of the discharges within a sinus, more active measures must be taken to reduce the swelling round the outlet of the affected cavity, so as to obtain evacuation of its contents. This end may generally be secured by the application of cocaine and supra-renal extract or by local blood-letting. The former method is thus carried out: if there is much general swelling a little 10 per cent. solution of cocaine may be first sprayed into the nose, and then, after two or three minutes' pause, pledgets of cotton wool squeezed out in a solution containing 10 per cent. of cocaine and 5 per cent. of supra-renal extract (p. 64) are packed into the nose as far as possible towards the opening of the affected sinus. After five minutes' interval, these are removed and other pledgets are introduced farther in still, and this is repeated till the pledgets can be applied to the neighbourhood of the ostium. By this means a free flow of discharge from the nose with relief of the symptoms often results. Some little effort on the part of the patient, or in

the case of the maxillary antrum bending the head down and to the opposite side, will often start the flow. Fresh swelling and blocking of the ostium may be prevented by the frequent use of warm alkaline lotion, to each ounce of which may be added twenty drops of hazelin for its astringent effect. After using this lotion the nasal cavities should be well sprayed with a 3 per cent. solution of menthol in paroleine. In spite of this the symptoms may recur, in which case the packing with cocaine and supra-renal extract must be repeated.

If these means fail, local blood-letting, which was first suggested by Lack, must be tried. This is carried out by lightly cocaineising the nasal cavity, and making deep incisions about three-quarters of an inch long into the anterior end and under surface of the middle turbinal, and along the outer wall of the nose as near the openings of the sinuses as possible. The bleeding and exudation is then encouraged by the use of warm alkaline lotion. These incisions should be made under a good illumination with a sharp-pointed knife, previously sterilised. When one of the anterior set of cavities is affected this method is often efficacious, quickly reducing the swelling of the mucous membrane, and allowing the escape of the retained fluid.

If polypi or hyperplastic growths are present, they should be removed ; and if the middle turbinal is much enlarged and in contact with the septum, its anterior third should be amputated (p. 233).

Other methods have been recommended for obtaining evacuation of the retained discharges ; for instance, blowing the nose violently, ordinary politzerisation (Hartmann), suction by means of a Politzer's bag or Sondermann's apparatus, or by sniffing violently with closed nostrils. Though these methods are occasionally successful, they cannot be recommended, as they may lead to infection of a healthy sinus or the middle ear.

If there is occlusion of the natural opening of the affected sinus, and the treatment recommended above has failed to give relief, or if pus is overflowing into the nose, the sinus must be washed out either through the natural ostium or through an artificial opening. The procedure will necessarily vary with the sinus affected.

The Maxillary Antrum.—This may very easily be washed out with but little discomfort to the patient through an artificial opening, whereas it is very difficult and often impossible to find the natural opening. The artificial opening may be made either

through the alveolar margin or through the inner wall of the antrum from the inferior meatus. If the infection of the antrum is undoubtedly of dental origin, or if the second bicuspid or first or second molar is carious and seems a possible cause of infection, gas should be administered, the tooth extracted, and the antrum opened by drilling through its socket in the manner fully described under chronic suppuration of the antrum (p. 271). It should then be washed out with boracic lotion and a tube or plug inserted into the opening, so that the irrigation can be repeated until there is no sign of pus left. One washing may often be sufficient, but if not it should be repeated night and morning till pus has quite disappeared. When it is certain that no fresh pus is being formed, the tube is removed from the alveolar border and the wound allowed to heal.

If there are no suspicious teeth, the antrum should be washed out through the outer wall of the inferior meatus under local anaesthesia. This is done by means of a trochar and cannula in the manner described under chronic suppuration (p. 273). When the cannula is in position the antrum is syringed out with boracic lotion until the fluid returns from the nose quite clear. The cannula is then withdrawn. In acute cases a single washing is generally sufficient, but if pus reappears in the nose, or if the cavity again becomes distended, this little operation should be repeated once, twice, or even thrice, if necessary. Should puncture and washing out the antrum fail to effect a cure, the case must be treated as one of chronic suppuration.

The Frontal Sinus.—To wash out the frontal sinus through an artificial opening is a more formidable matter. It entails an external operation, a long after-treatment, and more or less scarring. An attempt should therefore be made to wash it out through its natural opening. In the first place, cocaine and supra-renal extract having been thoroughly applied, especially in the neighbourhood of the infundibulum, the anterior third of the middle turbinate is removed in the manner already described (p. 233), and any thickened or oedematous mucous membrane on the outer wall cut away with punch forceps. These procedures may be followed by an escape of the retained secretions; but if not, a very careful and gentle attempt may be made to introduce a special cannula (Fig. 143, p. 286) into the sinus in order to wash it out. In acute cases, where pre-existent disease has not led to destruction of the normal structures of the nose, this is very difficult and

often impossible. No force whatever must be used, otherwise the cribriform plate may be fractured and meningitis result. (For the method of passing the cannula, see p. 285.) If the sinus is successfully reached, it should be washed out with boracic lotion and the process repeated daily as long as there is any pus. If the attempt proves a failure, the case must be carefully watched, and, if no serious symptoms develop, it may be left for a time, the simple intra-nasal applications recommended above being used in the meanwhile. At any time free drainage may be established spontaneously and recovery take place, owing to the dependent position of the ostium, but if serious symptoms supervene the sinus must be opened by external operation, when a free opening into the nose must be established and maintained on the lines which will be fully explained under treatment of chronic suppuration (p. 290).

Ethmoidal and Sphenoidal Sinuses.—The diagnosis of acute suppuration of these cavities and retention of pus within them is a matter of great difficulty. If the frontal sinus and the maxillary antrum can be fairly definitely excluded and urgent symptoms are present, the ethmoidal cells may be explored by removing the anterior half of the middle turbinate and opening one or more of the cells with a Hajek's hook under local anaesthesia (p. 282). If the sphenoidal sinus is suspected, the posterior half of the middle turbinate must be removed and the cavity washed out through the natural opening (p. 293).

III. CHRONIC SUPPURATION OF THE ACCESSORY SINUSES

Definition.—A chronic inflammation of the mucous membrane, and sometimes of the bony walls, of one or more of the accessory sinuses of the nose leading to a purulent discharge. If the ostium of the affected sinus is open and the pus escapes into the nasal passages, the condition is spoken of as "open" or "latent empyema"; if the ostium is closed and symptoms of distension occur, it is called "closed" or "manifest empyema"; whilst if the ostium is at times closed and at other times open it is called "alternating empyema."

Etiology.—When discussing the etiology of chronic rhinitis it was pointed out that it was generally the result of acute rhinitis, and that therefore the causes of the one were indirectly the causes

of the other, but that there were certain general and local conditions which rendered an acute rhinitis more prone to become chronic. Exactly the same may be said as regards acute and chronic inflammation of the sinuses, and it is only necessary now to see under what conditions the acute form is most likely to become chronic, for this only happens in a very small percentage of cases. It may occur under the following circumstances :—

- (1) When the patient is in extremely debilitated health from any cause.
- (2) When the original infection is due to one of the acute specific fevers, especially *influenza*.
- (3) When the ostium of the affected sinus is completely or partially obstructed by pre-existing chronic inflammatory thickening, by oedematous swelling, by polypi, by an enlarged middle turbinal, or by spurs and deviations of the septum.
- (4) When the severity of the acute attack has damaged the mucous membrane and destroyed the ciliated epithelium, so as to prevent the removal of secretions from the sinuses, especially from those in which the ostium is situated in its upper part.
- (5) When the original acute inflammation has led to serious deep-seated changes in the mucous membrane and in the underlying bone.

Apart from acute catarrh, chronic suppuration of the antrum may be caused by the presence of carious teeth or periodontal suppuration, or by the presence of a foreign body. Occasionally any of the sinuses may be affected in the course of tuberculosis, syphilis, malignant disease, or atrophic rhinitis. Finally, the antrum, without being in any way diseased, may contain pus. Owing to the position of its ostium at the end of the hiatus semilunaris and the shelf-like process of bone forming the uncinate process, it may happen that pus coming from the frontal or ethmoidal sinuses may flow into the antrum and be too great in quantity for the cilia to deal with. Later, however, chronic inflammatory changes are set up in the mucous membrane lining the antrum itself, owing to irritation caused by the presence of pus.

Pathological Changes.—These may be divided into the changes met with in the affected sinus and those seen in the nose.

Changes in the Sinus.—As the sinuses are lined by a mucous membrane inseparably connected with the periosteum of their bony walls similar to that covering the ethmoid bone, the results of acute and chronic inflammation are similar in the two regions (see p. 226). Within the sinus the muco-periosteum becomes first red, thickened, oedematous, and corrugated ; later, as the periostitis and consequent osteitis increase, definite polypi, which are in every way similar to ordinary nasal polypi, occasionally develop. The osteitis as a rule results in patchy sclerosis. Caries is uncommon and necrosis extremely rare, but when either occurs, the whole thickness of the wall may be destroyed and the disease spread beyond the limits of the affected cavity. Microscopically the changes usual in chronic inflammation may be seen, the ciliated epithelial cells being destroyed and replaced by cubical cells, which is an important fact from the clinical point of view.

Changes in the Nose.—Occasionally there may be no marked changes beyond perhaps a little redness of the mucous membrane covering the middle turbinal and outer wall of the nose. Absence of pathological changes is most common in recent cases of suppuration of the antrum, especially if of dental origin, and in some instances of frontal sinus disease. Much more often, however, the anterior end of the middle turbinate bone is enlarged and the mucous membrane covering it becomes inflamed and oedematous, or true polypi may be attached to its inferior border. Oedema or polypi may also occur on the outer wall of the nose about the uncinate process. If the oedematous outer wall and the swollen turbinate come into contact, the appearances suggest a cleavage of the middle turbinal (p. 227). This condition is common in suppuration of any of the anterior set of sinuses, and if a little pus is seen in the cleft the appearance is almost pathognomonic of sinus suppuration. Swelling and oedema at the posterior part of the upper surface of the middle turbinal is often found when any of the posterior set of sinuses are affected. Polypi are a very common accompaniment of sinus suppuration, especially in connection with ethmoidal cells. Again pus can generally be found either in the nose or post-nasal space. It may come from below or above the middle turbinal and be seen in the anterior part of the nose, or it may run backwards into the post-nasal space. The quantity, position, and character of the pus are very important in determining the existence of sinus disease, and the particular sinus or

set of sinuses affected. This will be further discussed under symptoms and diagnosis. Finally, it is often possible to find caries of the bone surrounding the ostium of the affected sinus. In searching for this it must be remembered that a very fine probe, especially if used at all roughly, may give very fallacious results.

Symptoms.—For the sake of convenience and as a help in determining which of the sinuses is affected, the symptoms will be divided into (1) those of sinus suppuration generally, (2) those indicating to which set of cells the sinus involved belongs, and (3) those indicating the particular sinus affected.

1. **Symptoms of Sinus Suppuration Generally.**—The symptoms of sinus suppuration vary very much both in degree and nature. They may be severe or almost entirely absent, and they may be constant or periodic. They are least marked when the empyema is latent or open ; most marked when it is closed or manifest ; and periodic when the empyema is alternating (see definition, p. 259). In other words the number and severity of symptoms almost entirely depend on whether the discharge is able to escape freely or is retained within the sinus. When the empyema is closed or manifest and the discharges are retained for any length of time, the symptoms soon become those of acute sinusitis with blocking of the ostium (p. 254). In latent empyema the following are the chief symptoms of which the patient complains : nasal obstruction and discharge, headache, localised pain and tenderness, subjective foetor, anosmia, aprosexia, mental depression, and irritability. In alternating empyema these symptoms vary in severity and are periodic. Often the headache, neuralgic pains, and other discomforts commence on rising in the morning and increase in intensity for two or three hours, until after becoming almost unbearable, they are suddenly relieved by a flow of discharge from the nose. As long as the discharge continues the symptoms remain in abeyance. This history is characteristic of suppuration of one or other of the accessory cavities, but most commonly of the frontal sinus or maxillary antrum. If the pain becomes unbearably intense it is generally the frontal sinus, if less severe, the maxillary antrum, which is affected.

The presence and degree of *nasal obstruction* entirely depends on the amount of oedematous swelling, and the number and size of polypi within the nose. It may consequently vary from mere stuffiness to complete obstruction.

The *discharge* may be constant or periodic, unilateral or bilateral, scanty or profuse. It is generally purulent, but sometimes mixed with mucus. If it is scanty and the nasal cavities wide, it is apt to dry into crusts, which have to be cleared away before the pus can be seen oozing from any particular region. A persistent purulent discharge from the nose, especially if unilateral, is always highly suggestive of sinus suppuration. The diagnostic value of the position and path of the discharge within the nose will be referred to later.

Complaints of more or less general *headache* are usual. It may be acute or of the dull heavy variety, or there may be a sensation of weight on or in the top of the head. Localised pain, often spoken of as neuralgia, and areas of tenderness are often present, but as they throw some light on the particular sinus involved, they will be further discussed below. Headache and neuralgia are, of course, common accompaniments of many other morbid processes, but if periodic or following on influenza, they strongly suggest sinus suppuration, the possibility of which must not be overlooked.

If the olfactory region is involved in the inflammatory process or if it is cut off by the presence of oedematous or polypoid swellings, *anosmia* will result. *Subjective fætor*, that is, fætor of which the patient is conscious but which is unnoticed by others, is common unless anosmia is present. It is sometimes the only symptom of which the patient complains. *Aprosexia*, or inability to concentrate the attention, great mental depression, and irritability of temper, though common in any nasal disease producing obstruction, are especially noticeable in some instances of sinus suppuration.

2. Symptoms Indicating the Set of Accessory Sinuses Affected.—Some indication as to whether the anterior or posterior set of cavities is affected can be gained from the position of intra-nasal swellings, from the position and the course taken by the discharge, and by the position of the pain in the head. If oedematous swelling and polypi are confined to the anterior third of the middle turbinal and to the corresponding part of the uncinate process on the outer wall, it is strong presumptive evidence that one or other of the anterior set of sinuses, that is, one of those which open into the hiatus semilunaris (Figs. 124 and 125), is affected. If, on the other hand, the swelling is confined to the posterior third or upper

surface of the middle turbinal, the probabilities are in favour of one of the posterior set being involved. Again, if pus is seen to be coming from under the middle turbinal or to be lying high up in the middle meatus, and if it is quickly replaced after being wiped away, suppuration of one or more of the anterior set of cavities may be diagnosed. If, on the other hand, pus is coming from above the middle turbinal or lying in the olfactory cleft, or if on posterior rhinoscopy it be seen tracking over the vault of the naso-pharynx or lying on the upper surface of the posterior end of the middle turbinal, one or more of the posterior set of cavities is in all probability affected. Too much stress, however, must not be laid on the mere presence of pus in the post-nasal space as indicating disease of the posterior cavities, for in certain cases of suppuration of the anterior cells, and especially of the maxillary antrum, no pus may be seen in front, but there may be a profuse post-nasal discharge. This is most likely to occur in disease of the antrum of dental origin, in which the interior of the nose is normal, that is, when the cilia of the nasal cavity are active and able to carry the discharge backwards to the pharynx along the normal route. In fact, in some cases of antral suppuration profuse post-nasal discharge may be the only symptom complained of by the patient.

As regards *headache* it may be said, broadly speaking, that frontal headache accompanies disease of the anterior set of cavities, and that occipital headache accompanies disease of the posterior set, whilst vertical headache may occur in either.

3. Symptoms Indicating the Particular Sinus Involved.—Indication as to the particular cavity affected may be obtained from a consideration of the position in which the greatest pain is felt, the situation of direct tenderness, and that of referred tenderness. Some help may also be gained by a further consideration of the discharge. Occasionally also a temporary redness of the overlying skin may indicate the sinus involved.

Symptoms Pointing to the Maxillary Antrum.—*Pain.*—This varies with the amount of discharge retained within the sinus, and with the chronicity of the disease. In some instances it may be most severe, in others entirely absent. In recent subacute cases, commonly met with after influenza, the pain is chiefly in the infra-orbital region and along the malar eminence, and there is often a specially painful spot about an inch in front of the

temporo-maxillary joint. There may also be pain in the teeth of the upper jaw. In more chronic cases the pain is chiefly over the side of the nose, and in the supra- and infra-orbital regions. Supra-orbital pain does not by any means always indicate sinus disease, as it may be due to pressure of an enlarged middle turbinal against the septum (p. 229).

Direct Tenderness is only met with in the more acute cases in which the sinus is distended by retained discharges. It may be discovered by pressure in the canine fossa or on the cheek.

Referred Tenderness.—Superficial tenderness, or rather sensitiveness of the skin is found on the side of the nose, over the malar bone, and in the supra-orbital region. That over the malar bone is strongly suggestive of antral suppuration, but that on the side of the nose and in the supra-orbital region may also be present in frontal and ethmoidal troubles, and is probably due to pressure of the middle turbinal against the septum (Lack).

The Discharge.—The discharge from the nose may be continuous and profuse, or noticeable only on stooping or bending down the head. The latter is highly suggestive of suppuration of the maxillary antrum, though it sometimes happens in frontal sinus disease. Further, if after cleaning the middle meatus, the discharge is not immediately replaced, but quickly reappears on bending the patient's head down and to the opposite side, there is a strong probability that the pus comes from the antrum.

Symptoms Pointing to Frontal Sinus Disease.—*Pain*.—In frontal sinus suppuration pain is more often present than in antral disease, and is generally periodic. It commences in the morning and increases in severity till the discharge begins to flow from the nose, being sometimes so severe as entirely to incapacitate the patient. It is most marked over the upper part of the forehead and top of the head, but it is also common in the supra-orbital region. Pain on the top of the head is the most frequent and characteristic symptom of frontal sinus suppuration.

Direct Tenderness.—In sub-acute or recent cases of frontal sinus suppuration there is often considerable tenderness on pressure over the sinus, especially in the angle between the orbital plate of the frontal bone and the nasal bone. In some chronic cases this tenderness can also be found and is a valuable diagnostic sign.

Referred Tenderness.—In addition to the areas referred to above as indicative of pressure of the middle turbinal against the septum,

superficial tenderness is often found on the top of the head and over the upper part of the frontal bone.

Discharge.—When the frontal sinus is affected the discharge is greater in quantity and more continuous when the patient is in the upright position. After being wiped away from the middle meatus, the pus commences to collect again almost at once. Its reappearance is not as a rule hastened by bending the head down.

Symptoms Indicating Disease of the Anterior Ethmoidal Cells.—

Pain.—As a rule there is not very much pain accompanying suppuration of these cells. There may be some dull aching between the eyes and on the vertex. If the pain is really severe, it generally means that the frontal sinus is affected as well as the ethmoidal cells.

Direct and Referred Tenderness.—Nothing of diagnostic value can be definitely stated on these points.

Discharge is most profuse in the upright position and is usually quickly replaced after being wiped away. When there are numerous polypi or small oedematous granulations in the ethmoidal region with pus exuding between them, suppuration will invariably be found in the ethmoidal cells with or without accompanying disease of other sinuses.

Symptoms Indicating Sphenoidal Disease.—**Pain** is by no means a constant symptom in sphenoidal suppuration. When present it is generally felt at the back of the head, but sometimes at the back of the eyes or deep in the nose. In rare instances pus may be retained and the sinus become distended, when acute headache accompanied by sudden blindness and paralysis of the ocular muscles may occasionally occur, and cases of thrombosis of the cavernous sinus have been reported.

The discharge is seen in the naso-pharynx, sometimes tracking over the vault, and sometimes collected on the upper part of the posterior end of the middle turbinate, where it often dries into crusts.

Symptoms Indicating Posterior Ethmoidal Cell Disease.—These cells are very rarely affected alone. Either the sphenoidal is also implicated or some of the anterior ethmoidal cells. In one case, reported by Watson Williams, in which the posterior ethmoidal cells were affected alone, there was a subjective sense of thickness over the frontal region, deep-seated headache and aching at the back of the eye, obscurity of vision, loss of memory, aprosexia, and discharge of pus from both anterior and posterior nares.

Complications.—Amongst the more important complications

may be mentioned—chronic pharyngitis, laryngitis, and bronchitis with acute exacerbations ; Eustachian catarrh and dry or suppurative inflammation of the middle ear ; acute septic tonsillitis ; recurrent attacks of facial erysipelas ; anorexia, dyspepsia, or symptoms simulating gastric ulcer ; anaemia and general debility ; septic infection of the veins or lymphatics causing secondary abscesses, meningitis, or other cerebral complications. In manifest or closed empyema, especially when the walls become weakened by caries or necrosis, the pus may escape from the affected sinus, causing cellulitis, abscesses, meningitis, or encephalitis.

Diagnosis.—It is necessary not only to discover the existence of sinus suppuration and to distinguish it from other diseases such as syphilis, tubercle, malignant growths, purulent rhinitis, ozæna, and other affections in which there is a chronic purulent nasal discharge, but also to make a diagnosis of the particular cavity or cavities affected. In manifest or closed empyema it is easy to diagnose both the existence of sinus suppuration and the cavity affected. In alternating empyema, when the symptoms are periodic and pathognomonic (p. 262), suppurative sinusitis may be diagnosed and, sometimes but by no means always, the particular sinus involved can be distinguished. In latent empyema the diagnosis is often very difficult from both points of view. The chief points to be borne in mind in latent and obscure alternating empyemata are (1) the character, position, path, and outflow of the discharge ; (2) the position of intra-nasal oedematous swellings and polypi ; (3) the presence of carious bone round the ostia ; and (4) the position of headache or neuralgic pains, and the areas of direct or referred tenderness. All these points have been already considered under the pathological changes and symptoms of suppurative sinusitis, and careful and detailed attention to them will in many cases lead to a correct diagnosis ; at any rate the set of cells, if not the individual cell, involved can generally be determined.

Transillumination.—When disease of the antrum is suspected help may often be gained by means of transillumination, a method first introduced by Heryng. It consists in comparing the amount of light transmitted through either side of the face when an electric light is placed in the mouth. In cases of unilateral nasal discharge, if the suspected side is dark compared with the normal side, it affords valuable corroborative evidence in favour of antral suppuration. In suspected bilateral cases, if both sides are dark, it affords

strong evidence of double antral disease, but it is less conclusive than in unilateral cases. This is all that can be said, for it has been found that in absolutely healthy conditions one or both antra may occasionally be dark, and, on the other hand, an antrum containing pus may be quite light on transillumination. Moreover, other diseases, such as a simple or malignant growth within the antrum, may render it dark and a cyst unusually brilliant. The following is the method of carrying it out: Heryng's lamp (Fig. 126) attached to a cautery holder, is connected with an electric battery or a wall plug with some apparatus for diminishing and increasing the strength of the light. If the patient wears artificial teeth, they should be removed, and the room then darkened. The lamp is introduced into the patient's mouth and placed beneath the hard palate, the patient's lips being tightly closed over the lamp. The light is then turned on by pressing the lever on the cautery handle and a careful comparison made between the sound



FIG. 126.—Heryng's lamp.

and the suspected side (Figs. 127 and 128). Three points must be noted: (1) whether there is a bright band of light immediately below the lower eyelids; (2) whether the pupils can be seen as red discs; and (3) whether the patient on closing his eyelids is conscious of the light equally in both eyes. If both sides are equal in these three respects the evidence is against pus in the suspected antrum. If, on the other hand, there is no bright band below the eye of the suspected side, and no objective or subjective light in the eye, the evidence is strongly in favour of suppuration of the antrum. Again, in suspected double antral suppuration, if there is darkness on both sides, the evidence is in favour of suppuration on both sides, but before coming to this conclusion the light should be increased to its greatest intensity, for occasionally on account of unusual thickness of the bones, or from some other cause, the light does not easily penetrate to the surface. On the other hand, differences between the two sides can often be accentuated by diminishing the intensity of the light.

Transillumination has also been used as an aid to the diagnosis of frontal and ethmoidal disease, but is of no practical value in such cases.

In spite of carefully weighing all the signs and symptoms of



Fig. 127.—Appearances on Transillumination under normal conditions.

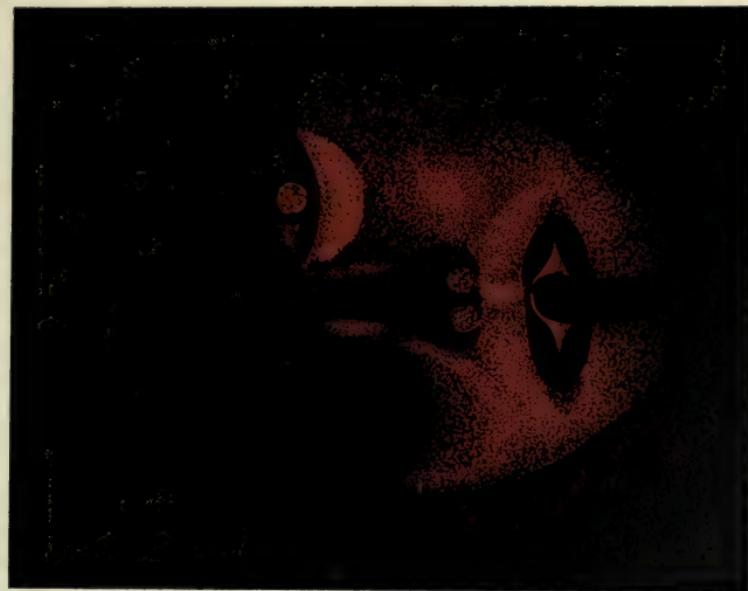


Fig. 128.—Appearances on Transillumination with the right side dark.

diagnostic value, it is often impossible to do more than determine to which set of cells the affected sinus belongs, and a final diagnosis can only be made by actually finding pus in the suspected cavity. This may be done in some rare instances by washing out the cavity through its natural opening, but it is almost always necessary to make an artificial opening.

As the exploration of a sinus through an artificial opening for diagnostic purposes is, as a rule, also the first step in the curative treatment, should pus be found, repetition may be avoided by describing the methods of exploring the various sinuses and their treatment altogether.

If definite signs pointing to the affected sinus are lacking, the order in which the accessory cavities should be explored and treated, if diseased, depends to some extent on the degree of morbid change within the nose. If there are multiple polypi and profuse suppuration suggesting extensive disease of the ethmoid bone, these conditions should be first dealt with in the manner described already (p. 242); but if there are no marked intra-nasal changes the various cavities must be dealt with *seriatim* in the order in which they are here described.

EXPLORATION AND TREATMENT OF THE SINUSES

I. Exploration and Treatment of the Antrum.—If there is no marked polypoid degeneration within the nose and the symptoms point to one of the anterior set of accessory cells as being involved, but do not clearly indicate which, the antrum should be first explored and treated if diseased. This may be done by irrigation either through the natural opening or through an artificial puncture. The artificial puncture may be made either through the alveolar border, through the outer wall of the inferior meatus, or through the canine fossa.

Irrigation through the Natural Opening is by no means so easy or satisfactory as through an artificial puncture, and does not give such clear indications of the existence of pus within the antrum, because there is no certainty that the cannula has entered the sinus. If it is decided to try the natural opening, the region of the middle turbinal and middle meatus should be rendered *anæsthetic* and *patent* by the application of cocaine and suprarenal extract (p. 64). An attempt is then made to enter the antrum with a probe of pliable metal bent into a curve. By

frequently altering the curve and making fresh attempts the ostium may possibly be found. If so, the probe is withdrawn



FIG. 129.—Method of performing alveolar puncture of the maxillary antrum.

and a cannula of soft metal, bent into the exact shape of the probe, is introduced. When in position a syringe is fitted on to the cannula, and the cavity irrigated. If this is successfully carried out once and pus found, it should be repeated daily in the hope of arresting suppuration. It is, however, painful for the patient

and tedious for the surgeon, and one of the methods of artificial puncture is to be preferred. The necessary manipulations are rendered much easier by removal of the anterior half of the middle turbinal, but this operation is quite as formidable as an artificial puncture and is not followed by such sure results.

Puncture through the Alveolar Border is indicated when there are any decayed teeth, which might be the cause of the suppuration. It may also be undertaken as an alternative to puncture

through the inferior meatus when there is a vacant space in the region of the second bicuspid or first and second molars. To perform this operation nitrous oxide gas is given to the patient sitting in a dental chair. If decayed teeth are present, especially the second bicuspid or first or second molars, these are first extracted. The alveolar border is then grasped between the thumb and forefinger of the left hand (Fig. 129) and an antrum drill (Fig. 130) is passed into the socket of the inner fang of the first molar, and worked upwards and slightly inwards by a backwards and forwards rotatory movement, such as is employed in using an ordinary bradawl, until it is felt to penetrate into the cavity of the antrum. This may occur with a jerk, and care must be taken that the drill does not slip through sufficiently far to injure the lower orbital plate.

The drill itself may be guarded with a shield (Fig. 131) or the forefinger may be firmly placed on the drill about an inch from the point, so that if it slips through, its onward progress will be checked. The antrum can be reached almost equally well through the socket of the second bicuspid or second molar or even from that of the first bicuspid. The point of the drill must be directed slightly backwards as well as upwards and inwards when perforating from the bicuspid sockets, and slightly forwards when from the second molar. When the antrum is perforated, the opening should be enlarged a little by pulling the drill backwards and forwards, and at the same time rotating it, so that a tube may afterwards be easily introduced. The object of the perforation is not to establish drainage into the mouth, but to render



FIG. 130.—
Antrum drill.



FIG. 131.—
Antrum
drill.

irrigation possible. The drill and the tube should therefore not be more than an eighth of an inch in diameter.

If one or more of these three teeth have been previously extracted, and there are no carious ones present which might be the cause of the antral disease, the perforation may be made through the vacant space in the same manner as above. If the teeth have been extracted a long time previously, the alveolar margin is often very hard and wedge-shaped with the apex downwards, in which case the drill is very likely to slip and travel between the bone and the mucous membrane. This may be avoided by first making a small incision through the gum, by steadyng the point of the drill between the finger and thumb of the left hand, and by working the drill lightly until the first quarter of an inch of the bone has been penetrated.

Having successfully perforated the antrum, the patient is allowed to recover from the effects of the gas, and then the antrum is washed out with warm boric lotion by means of a Higginson's



FIG. 132.—End-piece for antrum syringe.

syringe to which a special nozzle has been affixed (Fig. 132). The patient's head must be bent well forwards over a bowl during the syringing to prevent the fluid running back into the pharynx, and the bowl should be made

of glass or black pulp so that any discolouration of the lotion may be noticed. If the lotion returns through the nose clear, the antrum is healthy; if turbid and yellow-coloured, suppuration exists, provided always that the nasal cavity has been well cleansed previously. In the latter case the syringing is continued until the water returns clear, and then the nozzle having been withdrawn from the wound, a tube or plug just sufficiently long to enter the antrum is introduced through the perforation. If no pus is found the patient should be provided with some Condy or sanitas lotion with which to keep the mouth clean, and the wound is allowed to close at once.

If pus is found, the further treatment consists in keeping the antrum thoroughly clean by means of irrigation through the perforation. On the day following the operation this should be done under the supervision of the surgeon to make sure that the patient can successfully carry it out. It can then be left to the patient himself, who should do it at first night and morning and afterwards once a day until there is no pus to be seen. Irrigation may

then be omitted for two or three days on one or two occasions, and if after such intervals there is no pus found on washing, the case may be considered "cured" and the tube permanently removed. In some recent cases this successful result may occur in the course of a few days or weeks. In long-standing cases the discharge may persist in gradually diminishing quantities for as long as five or six months or even a year, and yet finally get well. If, however, after six months there is still a marked quantity of discharge, the probabilities are that the case will not get well by simple irrigation, and a more radical operation will be necessary. The occasional application of a 2 per cent. solution of sulphate of copper or of peroxide of hydrogen may help to arrest the discharge.

Though as a rule this operation is quite simple certain difficulties may arise. If the drill is directed too far inwards the floor of the mouth or nose may be perforated, if too far outwards and



FIG. 133.—Lichtwitz's trochar.

forwards the canine fossa; whilst slipping of the drill, as already mentioned, may cause perforation of the floor of the orbit. Occasionally it may be impossible to find the antrum at all owing to its being very small and situated high up, as may occur in some cases of extremely marked deformity of the palate (Lack), and in some cases of atrophic rhinitis (Macdonald).

Puncture through the Inferior Meatus.—This is the best method when all the teeth are present and quite sound. It affords the possibility of a definite diagnosis, and is in itself useful as a therapeutic measure in recent cases where washing out the cavity once or twice is likely to effect a cure. It can quite conveniently be carried out under local anaesthesia. Pledgets of cotton wool soaked in a 10 per cent. solution of cocaine with 5 per cent. of supra-renal extract are packed under the inferior turbinal and against the outer wall of the nose, while other pledgets are applied to the surface of the turbinal so as to cause as much shrinkage as possible. These are left in the nose for ten minutes and then removed. The inferior meatus is then well illuminated through a nasal speculum and Lichtwitz's trochar and cannula (Fig. 133), with the point of the trochar shielded within the

cannula, is passed into the nose. The point is placed against the outer wall immediately below the attachment of the inferior turbinal and about half an inch behind its anterior end. The handle of the trochar is carried over towards the opposite nostril displacing the cartilaginous septum from the middle line in such a way that the point is directed outwards, backwards, and upwards (Fig. 134). The nasal speculum can then be laid aside, and the patient's head



FIG. 134.—Position of trochar for puncturing the maxillary antrum from the inferior meatus.

steadied with the hand thus set at liberty. The point of the trochar is then extruded from the cannula and the instrument is pushed firmly and quickly with a rotatory movement through the bony wall into the antrum. As a rule the bone in this situation is very thin, and but little force is required to perforate it, but resistance may be met with if the point is placed too low down where the bone is thicker. If this should occur, its position must be altered and a fresh effort made to get quite close to the attachment of the inferior turbinal (Logan Turner).

The wall of the antrum having been successfully perforated the trochar is withdrawn, and the cavity is washed out through the cannula by means of a syringe. If pus is evacuated the syringing should be continued till the lotion returns from the nose quite clear. In recent cases this operation may be repeated at intervals of twenty-four or forty-eight hours on three or four occasions in the hope of arresting the suppuration, in doing which it is often successful.

Treatment through a Permanent Opening from the Inferior Meatus.

—In chronic cases when a definite diagnosis has been made, or in more recent cases when the above methods have failed to effect a cure, a larger and more permanent opening should be made through the outer wall of the inferior meatus so that the antrum may be washed out as often as may be necessary. The inferior



FIG. 135.—Tilley's burr.

meatus is first packed with pledgets of cotton wool soaked in the solution of cocaine and supra-renal extract (p. 64), so that the various steps of the operation may be interfered with as little as possible by haemorrhage. After ten or fifteen minutes' interval the wool is withdrawn and general anaesthesia is induced. The patient is placed on his back with the head slightly raised and turned towards the operator, who stands on the patient's right side. A good light is thrown into the nasal cavity through a speculum, and the anterior third of the inferior turbinal is removed with scissors and snare (p. 220). A rose-headed burr with a curved shaft and with a diameter of a quarter of an inch (Fig. 135) is then placed on the outer wall of the nose immediately below and about half an inch along the attachment of the inferior turbinal and pushed with a rotatory movement into the antrum. The bony wall dividing the antrum from the inferior meatus is then freely broken down with the burr in both a forward and backward direction. When this has been done the burr is withdrawn, and as much of the broken-down bone as possible is pulled out by means of curved forceps.

As a rule this operation is followed by considerable swelling of

the wounded mucous membrane, so that for the first few days there may be some difficulty in introducing the cannula into the sinus for the purpose of irrigation. No attempt should be made to do this for the first forty-eight hours, but then cocaine and supra-renal extract having been applied, a special cannula (Fig. 136) is introduced and the antrum washed out. After this the irrigation is



FIG. 136.—The author's antrum cannula.

repeated night and morning until the discharge has diminished in quantity and then once a day until it ceases.

Local anaesthesia is not, as a

rule, necessary after the first day or two. The patient should keep the nasal passage clean with the alkaline nasal wash, used at least night and morning. After the first week an attempt may be made to teach the patient to introduce the cannula and irrigate the antrum for himself. Sometimes this is an easy matter, but many patients fail to acquire the necessary manipulative dexterity. Even if the patient becomes apparently an adept at it, he should do it in the presence of the surgeon once every four or five days to make sure that all is well, otherwise he may return after a longer interval with the opening contracted and difficult to find.

If a patient object to a general anaesthetic, a smaller opening, which is sometimes sufficient, may be made under local anaesthesia.



FIG. 137.—Bond's burr.

The anterior end of the inferior turbinate should be removed at a preliminary sitting (p. 220), and when all swelling has subsided, the inferior meatus is cocainised and well illuminated and the outer wall is perforated with a small burr with a conical head (Fig. 137) at the spot already described. At yet another sitting the hole can if necessary be enlarged by specially shaped punch forceps (Figs. 138 and 139). The after-treatment is carried out as described above, but it is more difficult owing to the smaller opening.

Difficulties of these Operations.—It is generally an easy matter to puncture, or make a bigger opening into the antrum, from the inferior meatus, but occasionally difficulties may arise. Sometimes these measures are rendered extremely difficult by an unusually strong outward curve of the outer wall of the nose; at

other times the antrum may not reach down to the level of the floor of the nose, or its anterior portion may not be developed

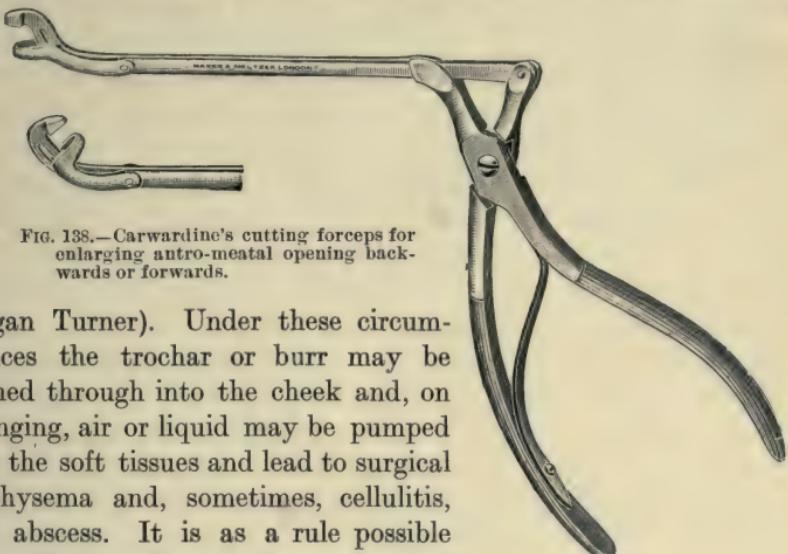


FIG. 138.—Carwardine's cutting forceps for enlarging antro-meatal opening backwards or forwards.

(Logan Turner). Under these circumstances the trochar or burr may be pushed through into the cheek and, on syringing, air or liquid may be pumped into the soft tissues and lead to surgical emphysema and, sometimes, cellulitis, and abscess. It is as a rule possible to avoid these dangers by perforating the bone just below the attachment of the inferior turbinal at a point about half an inch from its anterior end and by directing

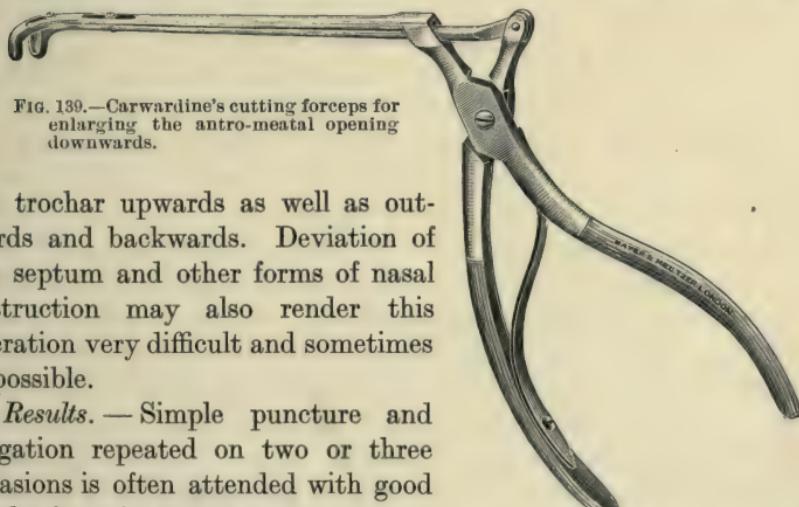


FIG. 139.—Carwardine's cutting forceps for enlarging the antro-meatal opening downwards.

the trochar upwards as well as outwards and backwards. Deviation of the septum and other forms of nasal obstruction may also render this operation very difficult and sometimes impossible.

Results. — Simple puncture and irrigation repeated on two or three occasions is often attended with good results in quite recent cases, and may be tried for even long-standing suppuration. The establishment of a permanent opening between the inferior meatus and the antrum, and daily irrigation, are in a great many cases attended by most excellent results, even when suppuration has existed for a very long

time. In fact arrest of suppuration may be expected, except when the bony walls of the antrum have become carious, or the mucous membrane has undergone marked polypoid degeneration.

Moreover, a cure will often quickly result from irrigation through a large opening in the inferior meatus even though the antrum has been previously washed out for months through an alveolar puncture. This suggests that even when it is necessary to extract decayed teeth, it may be better to abstain from puncturing the antrum through the alveolar border and to make a big opening through the inferior meatus instead, either at the time of the dental extraction or subsequently.

Puncture through the Canine Fossa.—This is seldom employed for merely diagnostic purposes. It is more difficult to perform, more painful for the patient, and is sometimes followed by swelling and even abscess of the cheek, due to infection from the antrum or the mouth. It may, however, be carried out when the teeth are all present and sound, and when puncture through the antro-meatal wall is rendered impossible by any of the abnormal conditions mentioned above. If pus is found, it is generally better to enlarge the opening and perform what will presently be described as the radical operation, though some surgeons attempt to arrest the suppuration by drainage or irrigation through the opening. To make the puncture a general anaesthetic is as a rule necessary. An incision about half an inch long must be made along the junction of the buccal mucous membrane with the gum above the first bicuspid tooth down to the bone, which is then perforated with an antrum drill or small burr. The antrum is washed out and the presence or absence of pus determined.

The Radical Operation.—If the above methods fail to arrest suppuration in from three to six months the question of a radical operation will have to be considered. In the majority of cases in which this is undertaken a cure may be anticipated, but not infrequently, though the patient is relieved of all symptoms, a cure cannot be claimed because some suppuration still continues. As the symptoms can equally well be kept in abeyance by washing the antrum out either through the alveolar border or through the inferior meatus, it may often be left for the patients to decide whether they will continue this treatment or undergo a more extensive operation. If, however, after one of the minor operations the pus continues in sufficient quantity to affect the patient's general health, or if the daily syringing is a source of mental worry,

the radical operation should be strongly advised ; and if swelling and tenderness of the cheek suggest extensive disease of the antral walls, it should be insisted upon.

The radical operation as now performed by most surgeons is a modification of that first recommended by Caldwell, and consists in making a large opening into the antrum through the canine fossa, through which local applications can be made to the lining mucous membrane, and in making a large counter-opening from the antrum into the inferior meatus of the nose, by which means free drainage can be maintained. It is thus carried out : a general anaesthetic having been administered, the teeth are slightly separated by a gag, the patient's head is turned on to the sound side, and a sponge is placed between the teeth and the cheek to absorb the blood. The operator stands on the right side for the right antrum and *vice versa*. The angle of the mouth and upper lip on the affected side are then firmly retracted and an incision a little over an inch long is made down to the bone in the position of the canine fossa at the reflection of the mucous membrane of the cheek and gum. The soft parts are reflected off the bone upwards and downwards so as to expose freely the canine fossa, and a small opening is made into the antrum with a drill. Having made sure, by means of a probe, that the antrum has been successfully entered, a large conical-shaped burr, three-quarters of an inch in diameter at its largest part (Fig. 140), is introduced into the drill-hole, and the opening gradually enlarged until the whole burr-head enters the cavity. This opening can equally well be made with a chisel and strong punch forceps. The index finger is then introduced into the antrum and its cavity is explored for polypi or areas of carious bone, which if found are carefully curetted. The antrum being a large cavity and surrounded by bony walls which cannot be removed so as to allow the soft parts to fall in, it is impossible to obliterate the sinus, and therefore the mucous membrane should not be removed. Diseased areas only should be gently curetted. The next step is to make a large opening into the inferior meatus of the nose, in doing which care must be exercised not to

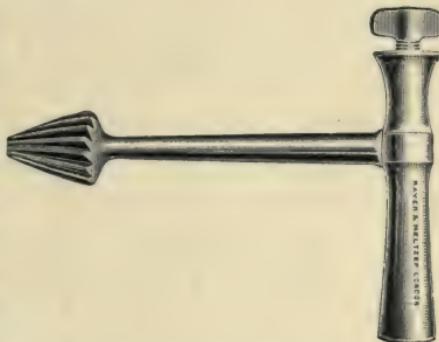


FIG. 140.—Burr for opening antrum.

injure the inferior turbinate body. A small rose-headed burr is first worked through the bony partition just above the floor of the antrum, and then the whole length of the lower portion of the inner wall of the antrum is broken down and removed with polypus forceps, or punched away with cutting forceps, guided by the frequent introduction of the index finger through the canine opening. Most of the partition is quite thin and easily removed, but just above the floor of the antrum the bone is often harder and a chisel may be required to round it off, so that there may be no ledge between the antrum and the floor of the nose. Care must be taken not to leave any loose pieces of bone in the antrum. Finally, if there are no marked degenerative changes in the mucous membrane the soft parts covering the canine fossa are allowed to fall back into position and heal. If, however, definite polypi or extensive bone disease have been found, the antrum must be kept open by packing it with gauze.

After-treatment.—The method of after-treatment will depend on whether the wound in the mouth is allowed to close or whether it is kept open by packing. In the former case it consists in keeping the nasal cavity clean by the use of the alkaline wash (p. 29), and in irrigating the antrum every day through the inferior meatus with a mildly antiseptic lotion such as Collunarium Sanitas or Collunarium Boro-glyceride (p. 29). This can be done with a Higginson's syringe to which an Eustachian catheter or special cannula (Fig. 137) is attached. For the first few days this may cause a little pain, and, if so, cocaine should be previously applied. After a day or two not only does it become painless, but the patient can do it for himself. Daily irrigation should be continued until no trace of pus can be seen, and then occasionally to make sure that there is no return of suppuration. It may be finally dispensed with except after acute rhinitis, when it is advisable to wash the antrum out till the muco-purulent nasal discharge has quite ceased.

If the condition of the mucous membrane within the antrum render it advisable to keep the wound in the mouth open, the packing should be left in position for forty-eight hours and then removed, and the antrum should be washed out and fresh gauze inserted. This should be repeated every second day. After an interval of about six days the interior of the antrum is inspected through a large ear speculum and examined with a probe for areas of diseased mucous membrane or carious bone, which, if found,

are gently curetted under cocaine anaesthesia, and chromic acid or nitrate of silver fused on to a probe (pp. 36 and 37) applied. If it is necessary for the purpose of such local applications to maintain the opening for more than ten days or so, a large india-rubber plug with a collar (Fig. 141) may be substituted for the packing, so that the cavity can be inspected and treated as occasion requires for a further period. When the amount of suppuration has materially decreased and the interior of the cavity looks healthy, the plug may be left out, the wound in the mouth allowed to close, and further treatment carried on through the inferior meatus as above directed.

The radical operation above described is of gradual development. Küster first made a large opening in the canine fossa, through which he packed the antrum with gauze, curetted the mucous membrane, and made local applications. A certain percentage of cases were thus cured, but re-accumulation of pus often occurred when the wound in the mouth was allowed to close, owing to the want of an opening at the lowest part of the antrum. Caldwell next suggested a small counter opening into the inferior meatus. This was attended with better results, but the meatal opening was often difficult to find and had a tendency to close. By removing the whole of the bone dividing the antrum from the inferior meatus, as above described, a permanent opening and absolutely free drainage are secured and a still greater percentage of cures obtained.

II. Exploration and Treatment of the Anterior Ethmoidal Cells.—When suppuration of the antrum has been excluded by exploratory puncture or arrested by treatment, the anterior ethmoidal cells should next be explored if pus is still present in the nose. The method of exploring these cells is the first step to opening them up for treatment and is carried out in precisely the same way.

The treatment consists in opening up the affected cell or cells freely in order to secure thorough drainage, and, if necessary, in curetting the mucous membrane lining them. This may be carried out by intra-nasal measures or by an external operation. The former are indicated in all cases, except when there is an external abscess or fistula, or when cerebral complications are present. Though the principles of all intra-nasal methods are similar, the method of carrying them out will vary with the extent of the disease.



FIG. 141.—
Antrum plug.

1. Intra-nasal Methods.—When the disease is *strictly limited* and not accompanied by multiple polypi, the affected cells may be opened up under local anaesthesia. Two or more sittings are necessary with definite intervals between them. At the first the anterior half of the middle turbinal is removed according to the directions already given (p. 233), and the outer wall is cleared of polypi and oedematous swelling. Polypi should be removed with a snare and oedematous swellings with cutting forceps, and in both cases an attempt should be made to take away a portion of the underlying bone. If this is successfully accomplished the

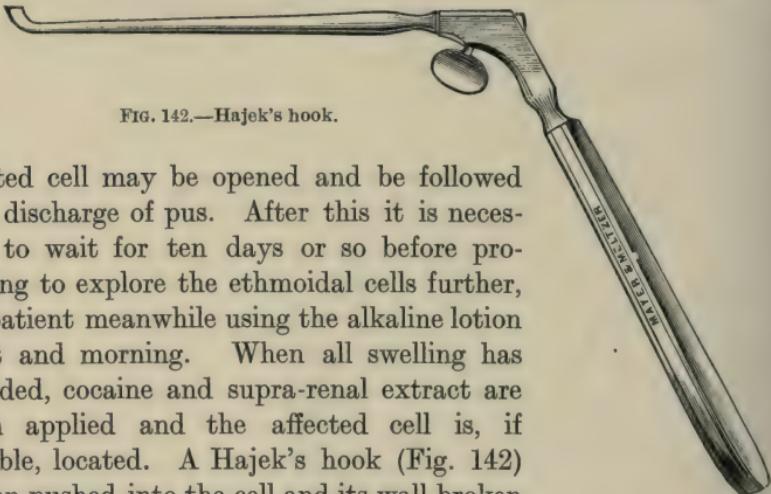


FIG. 142.—Hajek's hook.

affected cell may be opened and be followed by a discharge of pus. After this it is necessary to wait for ten days or so before proceeding to explore the ethmoidal cells further, the patient meanwhile using the alkaline lotion night and morning. When all swelling has subsided, cocaine and supra-renal extract are again applied and the affected cell is, if possible, located. A Hajek's hook (Fig. 142) is then pushed into the cell and its wall broken down. If pus escape, the opening thus made is enlarged with cutting forceps until free drainage is established. If infection of other cells is suspected, they may be similarly dealt with. This operation is followed at first by considerable oedema of the mucous membrane and sometimes by increased suppuration, and an interval of several weeks is often necessary before it is possible to judge of its results. The patient should, therefore, be instructed to use the alkaline nasal wash night and morning, and nothing further should be done until all swelling has subsided. If then pus is still present in any quantity a further attempt may be made to locate and open up affected cells. It is a question of some doubt how many such sittings are justifiable. They are wearisome, distressing, and depressing to the patient, they are not free from danger, and they often end in failure. It therefore seems better, if two or three attempts have failed to effect a cure, to put the patient under a general anaesthetic, to examine the ethmoid region

with the finger so as to define the affected area, and then to remove all diseased tissue thoroughly with a ring knife according to the method described on p. 242.

If the Disease is Extensive a more radical method must be adopted at the outset. Bearing in mind what has been said previously as regards inflammation of the muco-periosteum of the ethmoid region and the constant association of polypi with changes in the underlying bone (p. 226), it is not surprising to find clinically that extensive disease of the ethmoidal cells is invariably accompanied by marked rarefying osteitis and multiple polypi. If, therefore, in suppurative disease of the ethmoidal cells, multiple polypi or extensive polypoid degeneration of the mucous membrane be present, the treatment consists in removing the diseased structures, both soft and bony, and in opening up all the ethmoidal cells by one radical operation as described under the treatment of polypi (p. 242). If the maxillary antrum has been found by previous examination to be affected, as is so often the case in advanced ethmoidal disease, a permanent opening must be made through the inferior meatus in the manner described above (p. 275) either before or after curetting the ethmoidal region. If the teeth are decayed, they should be extracted.

2. External Operations.—When a fistula or orbital abscess is present, or cerebral symptoms complicate the case, it is better to open up the cells and remove the diseased tissues by an external operation. The eyebrow on the affected side is shaved and the skin purified. A general anaesthetic is administered, the mouth is held open with a gag, and a sponge inserted into the post-nasal space to keep the air passages free from blood. A curved incision is made just below the eyebrow commencing on the inner side of the supra-orbital notch and extending to half an inch below the inner canthus. It is carried down to the bone and the periosteum is reflected from the inner wall of the orbit. If there is a fistula or orbital abscess, the perforation through the bone is located, and the opening enlarged by means of a chisel, so as to expose the ethmoidal cells. All these are then broken down by means of a ring knife introduced within the nose and guided by the finger passed into the external opening, or *vice versa*. A large perforated drainage tube is then inserted into the wound and brought out through the nostril, and the wound above and below the tube is sutured with silkworm gut. After a week or so the drainage tube is replaced by a rubber plug, which can be removed

daily for cleansing the nose. The plug is gradually decreased in size and finally left out, and the wound allowed to close.

Access to the ethmoidal cells can also be gained by other external operations, such as Ollier's or Furneaux Jordan's, but the method described is preferable, especially when there is an abscess or fistula.

III. Exploration and Treatment of the Frontal Sinus.—

Final Diagnosis.—Should pus continue to appear under the middle turbinal or high up in the anterior part of the nose after the antrum and anterior ethmoidal cells have been definitely excluded as its source, it is almost sure to come from the frontal sinus. Corroborative evidence can sometimes be gained by passing a suitably bent probe into the sinus through the infundibulum. If, when withdrawn, the probe is covered with pus, or if pus follows its withdrawal, the evidence is in favour of frontal sinus disease, but it is not conclusive. It is always possible that the probe has entered one of the fronto-ethmoidal cells, or that the pus is coming from one of them along the probe.

In the majority of cases a definite diagnosis can only be made on opening the sinus by means of an external operation. This is a much more serious matter than puncturing the antrum or exploring the ethmoidal cells, and should not be undertaken unless the severity of the symptoms demand a radical operation. This method of exploration is the first step in a radical operation, and is described below.

Treatment.—In all cases of suspected frontal sinus disease there are two main methods of treatment; namely, intra-nasal and external operative measures. Intra-nasal methods include the establishment of free drainage from the sinus into the nose, and when possible washing out the sinus through the nose. External operations have in view either the obliteration of the sinus or the establishment of free drainage pending the recovery of the mucous membrane lining the cavity.

Intra-nasal Methods should always be tried first, unless very urgent symptoms are present, because at each step in the treatment a cure may result and external scarring and deformity thus be avoided, and also because external operations are not free from danger.

In order to secure free drainage from the sinus into the nose and to gain access to the infundibulum it is necessary in the first place to remove the anterior third of the middle turbinal

and any polypi which may exist, and to open up the anterior ethmoidal cells freely. The anterior third of the middle turbinal must be removed as directed on p. 233 under cocaine anaesthesia (p. 63), and an interval of about ten days allowed to elapse so that the wound may heal and all swelling subside. It may be found that all serious symptoms have been relieved, and that the pus is escaping freely. Under these circumstances it is safe to wait in the hope that the establishment of better drainage may effect a cure. In some instances it may be possible to pass a cannula into the sinus, in which case irrigation may be tried (see below).

If, in spite of the removal of the anterior end of the middle turbinal, pus does not escape freely and there is still pain, a general anaesthetic must be given and all the anterior ethmoidal cells broken down with a curette (p. 242). The uncinate process, if prominent and forming a distinct ledge, must also be removed, so as to open up the lower part of the infundibulum. An interval should now again be allowed to elapse, lasting this time four or five weeks, the nose being kept clean in the meanwhile by the use of alkaline or sanitas nasal wash (p. 29). When healing is complete, all urgent symptoms may have disappeared and the discharge of pus may have ceased or be rapidly diminishing in quantity, in which case no further treatment will be required.

A considerable number of cases may be cured by these means, and the majority will be rendered free from dangerous symptoms or complications. If, on the other hand, pus continues without diminution in quantity, irrigation through the natural opening may next be tried. As already pointed out, in a normal nasal cavity it is always very difficult and often impossible to pass an instrument into the frontal sinus, but when the middle turbinal has been removed and the anterior ethmoidal cells broken down by disease or operative measures, it is often possible and sometimes easy. In many instances, however, there must necessarily be some doubt whether the cannula has actually entered the frontal sinus or whether it has found its way into a fronto-ethmoidal cell, and its true position can only be determined by the use of X-rays and the fluorescent screen.

Method of Irrigation.—The upper part of the nose is first packed with wool soaked in solution of cocaine and supra-renal extract, some of which is also painted over the inferior turbinate, if this body obstruct the view. After removing the wool the nasal cavity is examined and the point from which pus is seen to be oozing is

noted, as this may act as a guide to the sinus. An attempt is then made to enter the sinus with a soft metal probe, the proximal end of which should be bent downwards so that the operator's hand does not obstruct the line of vision, while the distal end is curved upwards and forwards at an angle of about 135° (Fig. 143). The point of the probe is introduced into the anterior part of the middle meatus, where pus is lying, and very gently passed upwards and forwards in the direction of the sinus, keeping it towards the middle line. It may be necessary to withdraw the probe and alter its curve several times, and to vary the direction in which it is inserted, before it will travel towards the sinus. When, however, it has passed upwards for some distance and definite resistance to its progress is felt, the distance that the probe has entered the

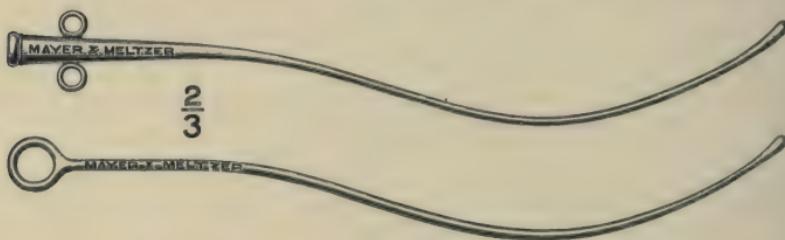


FIG. 143.—Hartmann's frontal sinus probe and cannula.

nasal cavity should be marked by the finger and thumb, and the probe withdrawn and laid against the outside of the nose. If the point reaches above the supra-orbital margin it is more than probable that it had entered the frontal sinus, in which case a cannula of soft metal (Fig. 143) is bent into exactly the same curves as the probe and passed along the same route into the sinus, which is then washed out by means of a Higginson's syringe with some mild antiseptic lotion such as boric acid or sanitas. The cannula is withdrawn and carefully preserved for the particular patient.

No force whatever must be employed in any manipulation for passing a probe or cannula into the frontal sinus. The thin cribriform plate is in close propinquity to the floor of the sinus and is easily fractured. It is even more dangerous to attempt to enter the sinus with a sharp pointed trochar and cannula, as sometimes recommended.

The further treatment consists in washing out the sinus daily for a fortnight, and then, if the pus is diminishing in quantity, every

other day for a time. This must, as a rule, be done by the surgeon, though sometimes it is possible to teach the patient to do it for himself. The progress of the case may sometimes be hastened by making local applications to the sinus after washing it out. All fluid is sucked out with the syringe and then iodoform emulsion, as suggested by Symonds, is injected into the sinus through the cannula whilst the patient is lying on his back with his head hanging over the end of a table or couch ; or the sinus may be occasionally irrigated with a 2 per cent. solution of copper sulphate or other astringent. The solution is injected through the cannula, allowed to remain there about half a minute, and then washed out with boric lotion. A 10 vol. solution of peroxide of hydrogen may be used in a similar way, and is sometimes useful in decreasing the discharge.

The results of irrigation are not often satisfactory, but it will occasionally arrest suppuration when intra-nasal drainage alone has failed. More often the benefit is only temporary and the method must be considered rather palliative than curative, except in very recent cases. The disadvantages of the method are that it is often difficult and tedious to both patient and surgeon, that it is not free from danger owing to the propinquity of the cribriform plate, and that it is possible that a healthy frontal sinus may be infected by the use of instruments. When it fails the question of external operation must be considered.

External Operations.—External operation is not necessary in every case of frontal sinus suppuration, even if intra-nasal treatment has failed to arrest the discharge. Provided there is free drainage into the nose and that there are no symptoms of retention of pus in the sinus, either continuously or periodically, the case cannot be looked upon as one of danger, and there seems to be no risk in leaving it alone. Periodic inspection and the removal of any œdematosus swelling which may interfere with drainage are, however, necessary. On the other hand, external operation is by no means free from danger, many fatal cases being on record ; it entails a long and careful after-treatment ; it is not invariably successful in arresting suppuration and affecting a complete cure ; and it is, moreover, followed by more or less scarring and deformity. Under these circumstances it is doubtful how far the surgeon is wise in advising an external operation. As a rule the better course is to leave well alone so long as no definite symptom arises demanding interference.

The indications which render external operation highly advisable and often absolutely necessary may be thus stated :—

1. Failure of intra-nasal methods to establish free drainage into the nose, as shown by persistence of pain and other symptoms.
2. Deterioration of the patient's general health from the continuous discharge.
3. Bulging of the sinus or inflammatory oedema over the sinus.
4. An external fistulous opening.
5. Symptoms of cerebral complications.

As before stated, external operations are undertaken with the view either of restoring the sinus to a healthy condition or of entirely obliterating it. Which of these methods should be adopted depends entirely on the condition found within the sinus when opened. The preliminary steps in both operations are the same, so that the operative treatment of the frontal sinus may be described under three heads, viz. (1) Opening and examination of the sinus ; (2) Drainage pending recovery ; (3) Obliteration.

The success of all methods of external operations for the cure of suppuration of the frontal sinus turns on the question of establishing efficient drainage. Unsuccessful results and serious complications are chiefly due to failure to procure and maintain this until such time as the mucous membrane has recovered itself or the sinus has become obliterated, as the case may be. The method of procuring the necessary drainage is therefore the most important question that the operator has to determine. All operations at present devised, though they may differ as to the skin incision, as to the amount of bone to be removed, and in other details, may ultimately be classified according to their methods of affording drainage, into three classes ; namely, those which rely on nasal drainage alone, those which rely on external drainage alone, and those which provide both free nasal and external drainage. If nasal drainage is relied on alone, and the external wound is closed, granulations and polypi are apt to spring up around the infundibulum and block it, the consequence of which is re-accumulation of pus within the sinus. This may lead to disease of the posterior wall, exposure of the dura mater, and cerebral complications, or the recently wounded diploic veins may become infected, resulting in spreading septic diploitis. This last complication, in spite of all treatment, surgical and medicinal, steadily progresses and is

invariably fatal; unfortunately it is by no means an uncommon complication. If external drainage alone is relied on, failure to arrest suppuration and the formation of a permanent fistula are not uncommon. If, however, both free external and free nasal drainage are procured and maintained until every trace of suppuration within the sinus ceases, or until the sinus becomes completely obliterated, recent experience shows that these complications are less frequent. The older operations, such as those advocated by Ogston, Luc, Jansen, Kuhnt, and others must therefore be modified with this end in view.

With these preliminary remarks the operative procedures to be recommended will be described in detail. They are founded on the older methods, but modified in accordance with more recent experience.

1. *Opening and Exploration of the Sinus.*—After shaving the eyebrow the skin is cleansed in the usual way, and a temporary dressing applied. A general anaesthetic having been administered, the mouth is held open with a gag, and a sponge, to which a long tape is firmly attached, is introduced into the post-nasal space so as to obviate difficulties due to blood flowing backwards into the throat. Following the line of the eyebrow just below and parallel to the supra-orbital ridge a curved incision is made down to the bone extending from the inner side of the supra-orbital notch on to the side of the nose. The haemorrhage, which is very free, is arrested with pressure forceps, and the periosteum turned off the inner part of the roof of the orbit. A small opening is then made by means of a chisel or gouge into the sinus at a spot vertically above the inner canthus, and just below the orbital ridge. This spot is selected because, according to the investigations of Logan Turner, the sinus, whatever its shape or dimensions, will be met with here, if any sinus at all exists. Further, Lack points out that if in this position a marked diplöe be met with on cutting through the bone, it is almost certain that there is no sinus, and he strongly advises desisting from the operation for fear of cutting straight into the cerebral cavity. Hence a chisel or gouge should be used in preference to a drill or burr. Having gradually cut through the bone the mucous membrane of the sinus may be recognised by its dark bluish colour. This is an important point, for the dura mater is white, and consequently should a mistake have been made it is possible to recognise it and stop before any very serious damage is done. The mucous membrane is then opened

with a probe or by a nick with the knife and pus carefully sought for. If none is found and the interior of the sinus seems healthy there is no need to proceed further; the wound is closed with sutures and dressed antiseptically. If, on the other hand, pus is found, the interior of the cavity should be carefully examined with a probe to determine its size and shape. The skin incision is then enlarged downwards along the side of the nose to the level of the inner canthus, and outwards to the limits of the sinus, and the opening into the sinus is enlarged sufficiently to enable the whole of the cavity to be examined, and the condition of the mucous membrane and the posterior wall to be determined. It must be ascertained whether polypi or degeneration of the mucous membrane are present, whether the bone of the posterior wall is diseased, or whether there is a perforation exposing the dura mater. The result of this examination must determine the question whether the sinus should be obliterated or whether an attempt should be made to restore the cavity to a condition of health. Obliteration is the surest and safest method and ought generally to be adopted as a routine practice. It is especially indicated when the lining walls of the cavity are much degenerated, when there is much bone disease, and when the dura mater is exposed. It is contraindicated when the sinus is so unusually big as to render obliteration almost a physical impossibility or when the resulting depression would amount to a deformity. Under these circumstances an attempt must be made to arrest the suppuration by establishing free drainage, and this procedure may also be adopted in some cases of more or less acute suppuration of the frontal sinus with obstruction of the fronto-nasal duct.

2. *Drainage of the Sinus without Obliteration.*—As before pointed out the success of this operation depends entirely on establishing free drainage both into the nose and through the external wound. The following is the method of carrying it out:—having opened the sinus sufficiently to make a thorough examination and having decided against obliteration, any polypi should be carefully removed and degenerated mucous membrane gently curetted, but great care must be exercised to do as little damage as possible to healthy mucous membrane, for the greater the injury the longer must the healing process be. The periosteum is then reflected from the inner portion of the under surface of the floor of the sinus and from the inner wall of the orbit. In doing this the pulley of the superior

oblique will be displaced, and during convalescence the patient may in consequence complain of diplopia. This, however, passes off in the course of a few weeks, and need cause no anxiety. The inner portion of the floor of the sinus and the inner wall of the orbit are then cut away with strong punch forceps so as to reach the infundibulum. A probe being passed down into the nose as a guide, more bone is chipped away until the infundibulum is freely opened up. A curette is introduced into the nasal fossa, and under the guidance of a finger passed through the wound the anterior ethmoidal cells are freely broken down until it is possible for a finger passed into the nose to come in contact with the finger in the wound. A careful search must be made for unusually large fronto-ethmoidal cells. These may extend outwards and



FIG. 144.—Lombard's bone forceps.

backwards for a considerable distance beneath the floor of the frontal sinus, and if diseased and not opened up may lead to continued suppuration and even to spreading septic diploitis, as in a case reported by St. Clair Thomson. Finally, a large perforated rubber drainage tube is passed from the wound into the nose and out of the nostril, the upper end being stitched to the inner angle of the wound. The rest of the wound is then sutured with chromicised silkworm gut, and a cold wet antiseptic dressing is applied.

3. *Obliteration*.—If after opening the sinus and examining its interior it is decided to obliterate the cavity, the periosteum is reflected from the whole of both the inferior and anterior walls and then the walls themselves are removed with strong cutting forceps (Fig. 144). The infundibulum is opened up and the anterior ethmoidal cells broken down in precisely the same manner as has been just described. The mucous membrane lining the sinus, healthy and unhealthy alike, is entirely removed by means

of a curette. A careful search must be made with a probe for recesses in the sinus, which are not uncommon, care being taken not to leave any mucous membrane which might be a source of continued suppuration. A large drainage tube is then introduced through the infundibulum and out of the nose, and its upper end stitched to the inner angle of the wound. If the sinus is very large a little gauze should be introduced upwards into the cavity and brought out by the side of the drainage tube, but it is generally possible to dispense with this after the first day or two. The external part of the wound is then sutured, and cold wet dressings applied. By removing the whole of the anterior and inferior walls of the sinus the soft parts are allowed to fall back into the cavity and so greatly help in its obliteration. Killian has suggested that, when the frontal sinus is large, the deformity, which often follows the complete removal of both the anterior and inferior walls, may be prevented by leaving the upper bony margin of the orbit in the form of a narrow bridge. *Æsthetically* the result of this is certainly very good, but it considerably delays the process of complete obliteration and so prolongs the after-treatment. The method is now extensively adopted.

After-treatment.—Whichever operation is performed the after-treatment is very similar. There is always considerable oedema, and sometimes ecchymosis of the upper eyelid, so that cold wet compresses should be applied and frequently changed. The drainage tube must be left in position for forty-eight hours, when it should be removed and the sinus and infundibulum washed out. The stitches fastening the tube to the edge of the wound are severed and a long piece of silk thread is attached to its upper end. The tube is then drawn out from the nose and the sinus and nasal cavity are washed out with boric or sanitas lotion. The tube is also syringed out and then drawn back in position by means of the silk thread, which finally is fastened to the forehead with a small piece of strapping. This process should be repeated once or twice daily for ten days or a fortnight, when the drainage tube is replaced by Lack's silver cannula (Fig. 145) or solid rubber plug (Fig. 146). This must be worn until all discharge ceases, being removed once or twice daily, according to the amount of discharge, for irrigation of the sinus and nose. After a time the patient may be taught to do this for himself. The external part of the wound as a rule heals rapidly, so that the stitches can generally be removed

on or about the seventh day. The great advantage of a solid plug is that it maintains free external drainage and prevents closure of the passage from the sinus into the nose, whilst it is less uncomfortable to wear and more easily removed than a drainage tube. It must be worn until every trace of discharge has ceased, and in the case of obliteration until the sinus has been completely filled in with granulation tissue.

After the operation for the re-establishment of drainage without obliteration, the interior of the sinus may in recent cases become healthy and the discharge cease in the course of a few weeks, but in chronic cases it may take months. Sometimes progress towards

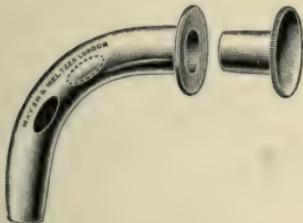


FIG. 145.—Lack's silver plug.



FIG. 146.—Lack's solid rubber plug.

recovery is so slow that it is better to re-open the wound and proceed to obliterate the sinus by removing the whole of its anterior and inferior walls.

After the operation for obliteration the sinus generally fills in, and the discharge ceases in from three to five weeks, though if the sinus be very large it may take considerably longer. If the plug is taken out too soon and the external wound allowed to close, a small abscess will form at the inner angle of the orbit. If this occurs, it should be at once opened and drained. The results of this operation are generally satisfactory, for if the sinus is successfully obliterated there can be no question as to the permanency of the cure. The risk of diploitis is small if the external wound and the passage into the nose are kept freely open by means of the solid plug until healing of the sinus is complete.

IV. Exploration and Treatment of the Sphenoidal Sinus.—If the signs and symptoms point to one of the posterior set of cells being involved, either in the first instance or after the anterior set have been treated, the sphenoidal sinus should be first explored. To obtain a view of this sinus by anterior rhinoscopy and to render

it possible to reach it with instruments, it is generally necessary to remove the whole or at any rate the posterior part of the middle turbinal. In atrophic rhinitis, however, in the course of which the sphenoidal sinus often becomes infected, it is frequently possible to see the natural opening of the sinus, after cleansing the nose and applying cocaine and supra-renal extract, without interfering with the middle turbinal. Having obtained a view of the sinus, pus may sometimes be seen oozing out of the ostium, but, if not, a probe should be gently passed through the opening. If pus is present, a little will usually escape on withdrawing the probe and thus the diagnosis may be confirmed.

Having ascertained the presence of pus in the sinus an attempt may first be made to arrest the suppuration by means of irrigation through the natural opening. A cannula is intro-

duced and the sinus is washed out daily with boric lotion. If progress is slow, Hajek recommends injecting a little 2 per cent. solution of copper sulphate after irrigation. It is allowed to remain within the sinus a few seconds and is then washed out with boric lotion. The method of irrigation is successful in a certain number of cases, but no permanent benefit can be expected if the mucous membrane lining the cavity has undergone polypoid degeneration, or if the bony walls are carious. If, therefore, no progress is being made by means of irrigation, further operative measures should be undertaken with the view of establishing free drainage and removing diseased tissues. Both these objects are gained by the free removal of the anterior wall of the sinus, but bearing in mind the relationship of this cavity to the cavernous sinus and other important structures it is necessary to proceed with care and caution. The following method, recommended by Hajek, is the safest and most efficacious. Local anaesthesia, which is as a rule sufficient and very much better than general anaesthesia from the

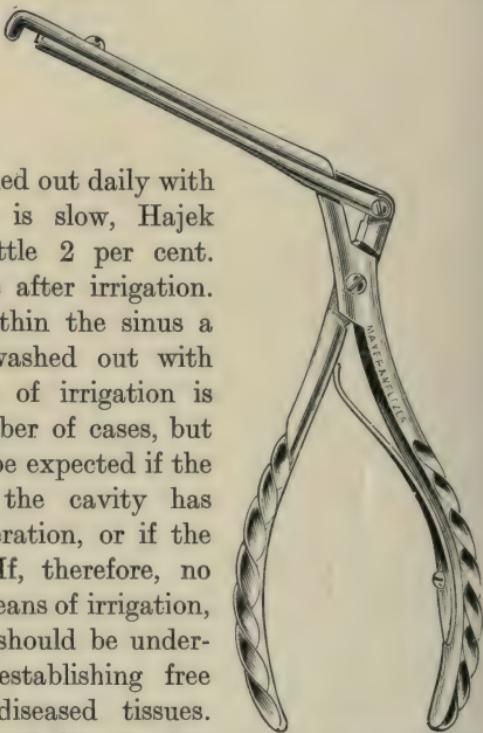


FIG. 147.—Sphenoidal sinus forceps (Lack's).

operator's point of view, is induced by the application of cocaine and supra-renal extract (p. 63) to the inferior and middle meatuses and to the anterior surface of the sphenoidal sinus. A thoroughly good illumination of the nasal cavity must be obtained and a Hajek's hook guided into the natural opening of the sinus. By pulling the hook forwards the whole of the anterior wall of the sinus is broken down and the fragments of bone removed with Grünwald's forceps. In some cases after enlarging the opening with Hajek's hook, the anterior wall can be more rapidly removed with special cutting forceps (Fig. 147). The next step is to examine the interior of the sinus for polypi or granulations. If any are present they must be gently scraped away with a curette, doing as little damage as possible to healthy mucous membrane, so as not to delay healing. Great care is necessary in using the curette within the sphenoidal sinus, for cases are recorded in which the cavernous sinus has been wounded.

The after-treatment consists in washing out the cavity with boric lotion, and in preventing contraction of the opening. Irrigation should be carried out by the surgeon at first daily and then twice a week, and the cavity cleaned out with swabs of cotton wool on a carrier, until the edges of the wound are healed and there is no fear of contraction. The patient should syringe the nose gently once or twice daily with boric lotion. If healing is slow the cavity may be occasionally swabbed out with a 2 per cent. solution of copper sulphate, and if there is any tendency to contraction, the wounded edges may be touched with nitrate of silver fused on a probe and the cavity packed for a time with gauze.

The results of this operation are generally very satisfactory. Suppuration usually ceases in a few weeks' time.

If the patient is under a general anaesthetic for curetting polypi or the anterior ethmoidal cells, a finger may be introduced through the posterior nares and the anterior surface of the sphenoidal sinus examined. If this is found soft and crumbling, the ostium may be enlarged by breaking down the anterior wall with a curette guided by the finger. In this way Lack has cured three cases, but for anatomical reasons it requires great care and gentleness.

Other Methods.—1. *Intra-nasal.*—Most of the other intra-nasal methods recommended by various authorities entail perforating the anterior wall of the sinus with some sharp instrument or with a drill or burr. Some of them are undertaken without even obtain-

ing a satisfactory view of the sinus by previous removal of the middle turbinal, or ascertaining its shape and dimensions by examination with a probe passed through the ostium. Considering the anatomical relations of the sinus and the variability of its size and of the thickness of its bony walls, such methods cannot be considered safe or advisable.

2. *External Operations.*—It has been recommended that the sinus should be reached through the ethmoidal cells. The latter are opened through a curved incision at the inner angle of the orbit and cut away one by one until the sphenoidal sinus is exposed. It need hardly be mentioned that this operation is extremely difficult and has no corresponding advantages.

Again, Jansen has recommended reaching the sinus through the maxillary antrum by means of a large opening in the canine fossa. Onodi has shown from examination of skulls that this is only occasionally possible and that the attempt is not free from danger. In short there is nothing to be gained by these difficult and tedious external operations over the simpler and safer method above recommended.

V. Exploration and Treatment of the Posterior Ethmoidal Cells.—If no pus is found in the sphenoidal sinus, or if pus continues to appear after it has been successfully treated, the posterior



FIG. 148.—Watson Williams' cutting forceps.

ethmoidal cells must be opened up. To do this it is necessary first to remove the whole of the middle turbinal so as to expose the cells to view, and at the same time to get rid of any polypi which may exist. Later, when healing has taken place, it may be possible under local anaesthesia to trace the pus to its source. The diseased cell or cells must then be opened up. This is best done by first breaking down their walls with Hajek's hook and then removing them with cutting forceps, or if a thoroughly good view can be obtained, Watson Williams' sharp-pointed cutting forceps may be used (Fig. 148).

If the middle turbinal has not been previously removed,

the whole operation should be done at one sitting under gas anæsthesia slightly prolonged with ether. The patient is placed sitting in a chair and a lamp is so arranged that a good light can be reflected into the nose. The middle turbinal is removed with a spoke-shave, and the posterior ethmoidal cells are opened up with a ring knife.

CHAPTER XI

CHRONIC INFLAMMATORY AFFECTIONS OF THE NOSE (*continued*)

CHRONIC DRY RHINITIS: The *Plethoric Form*—The *Anæmic Form*. **CHRONIC PURULENT RHINITIS:** Definition—Etiology—Treatment. **ATROPHIC RHINITIS:** Its Etiology, Pathology, Symptoms, and Treatment. **RHINITIS CASEOSA.**

RHINITIS CHRONICA SICCA

THERE are two varieties of dry rhinitis, which may be called the plethoric type and the anæmic type. They are so different in their etiology, characteristics, and treatment that they are best described separately.

I. The Plethoric Type.—**Definition.**—A chronic inflammation of the nasal mucous membrane characterised by swelling and dryness, and by the formation of crusts.

Etiology.—The original cause is probably an acute rhinitis, but the characteristic dryness is determined by the habits and general condition of the patient. It is of frequent occurrence in people with gouty tendencies, especially if they are alcoholic or dyspeptic, and in people of a full habit of body, especially if they indulge their appetites too freely. It is commoner in males than in females, and is most often seen between the ages of twenty-five and fifty. Certain occupations involving exposure to dust or a hot dry atmosphere greatly aggravate the condition and may even cause it. Thus it is common amongst millers, ivory-turners, stokers, boiler-makers, and engine-room workers.

Pathological Changes.—On examination of the nose the whole mucous membrane is seen to be intensely injected and dry, while the inferior turbinals are red, swollen, and shiny. Streaks of mucus may be seen stretching across from the other wall to the septum and small grey or black crusts are scattered about the nose. Larger crusts are generally present on the cartilaginous septum, just within the vestibule, and on the anterior end of the middle turbinal. They consist of mucus in which dust and other impurities of the atmosphere are imbedded. Occasionally the nose

may be almost filled with such crusts, but they never assume the dirty green appearance of the crusts of atrophic rhinitis, and they never become foetid. In cases of long duration there is secondary dryness of the naso-pharynx, pharynx, and larynx, with a few crusts here and there, and sometimes great thickening of the mucous membrane of the larynx.

The most marked change, and one which is met with in quite a large number of cases of rhinitis sicca, is perforation of the cartilaginous septum. It occurs just beyond the vestibule and a little above the floor of the nose. As just stated, crusts are very likely to form here, and especially when there is any deviation or spur of the septum. These crusts either separate, or more usually are picked off with the finger-nail, leaving a slightly abraded surface. Another crust quickly forms and is again picked off leaving a deeper abrasion, and the process is repeated until a hole is picked through the septum. The resulting perforation is round or oval, seldom exceeding the size of a threepenny bit ; it is invariably confined to the cartilaginous portion of the septum, and when healing is completed its edges are perfectly regular and smooth and covered with mucous membrane.

Symptoms.—Discomfort and stuffiness of the nose are the chief symptoms, the amount of stuffiness varying with the atmospheric conditions. In spite of the general dryness a profuse watery discharge is excited by changes of temperature and by exposure to cold winds. There is often considerable irritation at the site of the crust on the septum, which leads to picking the nose, and on separation of the crusts severe epistaxis is not uncommon. If the pharynx and larynx become affected the symptoms of pharyngitis sicca and laryngitis sicca are added, and it is often for these that relief is sought. A perforation of the septum gives rise to no symptoms whatever.

Diagnosis.—In severe cases of rhinitis sicca accompanied by extensive crust formation there may be some little doubt as to whether the case is one of atrophic rhinitis. The character of the crusts, the absence of foetor, and the fact that the inferior turbinals are full and rounded rather than atrophied, determine the diagnosis in favour of rhinitis sicca. When a perforation has occurred, it may be difficult and even impossible to distinguish it from one due to syphilis, tuberculosis, or traumatic rhinitis. In syphilis the perforation is only in rare instances confined to the cartilaginous septum ; it is large and irregular in shape, whilst its

edges are generally thickened and uneven, and other signs of destructive ulceration are frequently present. In tuberculosis the edges of the perforation are rarely completely healed and healthy; it commences in the cartilage, but may occasionally spread to the bone; it is irregular in shape and some other signs of tuberculous disease are usually present. The perforation resulting from destructive form of traumatic rhinitis (p. 206) is more extensive and situated farther back than that due to rhinitis sicca.

Treatment.—Seeing that rhinitis sicca is generally secondary to some general condition, general treatment is quite as important as the local. The bowels should be carefully regulated, and at first somewhat free and watery evacuations encouraged by a morning dose of *Mistura Alba* or some natural aperient water such as *Friedrichshall*. If dyspepsia exists, it must be treated by appropriate medicines and by careful regulation of the diet. Alcohol should be prohibited or at all events reduced to a minimum, and smoking should be temporarily forbidden. Outdoor exercise is very important, and in some patients Turkish baths and massage may be useful.

Locally, gentle stimulation of the mucous membrane and the prevention of crusts, especially on the septum, are the two chief indications. The best local stimulants are chloride of sodium and chloride of ammonium. From five to ten grains of either of these should be added to one ounce of the *Collunarium Alkalimum* (p. 29), and sniffed up the nostrils (p. 45) three times a day. To prevent the formation of crusts the nasal cavities should be sprayed with menthol in *paroleine* (six grains to the ounce) after using the nasal wash. If this is not sufficient and crusts continue to form on the septum, they should be softened by the application of warm oil on cotton wool and gently removed, and the abraded surface painted with equal parts of *Unguentum Acidi Borici* (B.P.) and *paroleine*, or with the *Nebula Hydrargyri Nitratis* (p. 50), applied by means of a large camel-hair brush, or swab of cotton wool on a probe, three times a day after washing the nose. The formation of crust may also be prevented in many instances by spraying the septum with atomised *vaselin* (p. 33).

If the pharynx and larynx are affected, they must be treated as suggested in Chapters xix. and xxiii. respectively, but it must be remembered that such treatment is of quite subsidiary importance to attention to the nose. If the condition is caused

or aggravated by the occupation of the patient, the nasal cavity should be protected from irritation by cotton wool introduced into the nostrils during work hours.

II. The Anæmic Type.—Definition.—Anæmia of the mucous membrane of the nasal fossæ with arrest of secretions and the tendency to the formation of small crusts.

Etiology.—As may be gathered from the definition the chief etiological factor is general anæmia. To this may be added working in a dusty, hot, dry, and vitiated atmosphere. It is much more common in females than in males, and occurs chiefly between the ages of seventeen and thirty.

Pathological Changes.—The inferior turbinals are one of the very first regions to show the effects of anæmia, even before the gums and conjunctivæ. If the patient has previously had a healthy nose, anæmia causes collapse of the erectile tissue, so that the exact shape of the inferior turbinated bones can be seen covered by a thin white mucous membrane. If the patient has been previously suffering from chronic rhinitis, the turbinated bodies may be swollen from turgescence, but they are pale in colour. In either case the glands will be found to have ceased work, causing dryness of the mucous membrane, and here and there small grey crusts can be found, especially on the septum and anterior end of the middle turbinal. Perforation of the septum is perhaps even more common in the anæmic cases than in the plethoric, because, nutrition not being so good, attempts at repair are more feeble. The pharynx and larynx are also liable to become secondarily affected, the mucous membrane being anæmic and dry, but without signs of inflammatory thickening such as occur in the plethoric form.

The symptoms are those of general anæmia, to which are added the discomforts of dryness of the mucous membrane of the upper respiratory tract.

Treatment.—This is also that for general anæmia, and consists, broadly speaking, in keeping the bowels open by means of a morning dose of Carlsbad salts, in administering increasing doses of carbonate of iron, in seeing that the patient avoids hot, stuffy, dusty, and ill-ventilated places, and obtains plenty of fresh air and exercise, alternating with periods of complete rest in the recumbent position.

The *local* treatment is the same as in the plethoric form. Generally the use of a stimulating lotion, such as the Collunarium

Alkalimum with five grains of chloride of sodium to each ounce is quite sufficient, but if there are any signs of a perforating ulcer, the steps mentioned above (p. 300) must be taken to prevent perforation of the septum.

CHRONIC PURULENT RHINITIS

Definition.—A chronic muco-purulent discharge from the nose without marked turgescence or hyperplasia of the mucous membrane, usually commencing and always most marked in childhood, but sometimes persisting throughout adult life.

Etiology.—It is generally the result of repeated attacks of a simple acute catarrhal rhinitis, but may follow one of the acute specific fevers, especially when local manifestations have occurred in the nose. It may commence at any time from six months to seven or eight years of age.

Pathological Changes.—When the case is first seen, and this is nearly always a long time after the commencement of the trouble, there are no very marked changes in the nasal fossæ to be observed with the naked eye. The discharge is generally profuse, yellow in colour, and often obstructs the view. The pus is mixed with mucus in varying proportions; at times it far exceeds the mucus, but at other times the mucus is only just tinged yellow with pus, whilst occasionally it is almost pure pus. On wiping away the discharge the mucous membrane is found to be hyperæmic, but there is no marked swelling or hyperplasia.

Symptoms.—The chief symptom is the existence of a more or less profuse muco-purulent discharge from both nostrils. It often fills the nasal cavities and runs forwards on to the upper lip or back into the naso-pharynx and pharynx. Unless the nose is constantly cleansed by blowing, there will be nasal obstruction and mouth breathing, but, as long as the nose is kept free from secretion, nasal respiration is unimpeded. In infants who cannot blow the nose, the obstruction may be very marked and give rise to serious symptoms (p. 198). The discharge is never foetid.

Diagnosis.—This disease may have to be distinguished from rhinoliths, foreign bodies, and syphilitic necrosis. If a careful examination is made, mistakes can hardly occur.

Prognosis.—If the disease is seen and treated early in its course, there is considerable probability of its being arrested. It

may not always be entirely cured, but it can be prevented from getting worse. The most important point for consideration with regard to the prognosis is whether purulent rhinitis ever causes other troubles. Bosworth considers that purulent rhinitis is the precursor of atrophic rhinitis with ozæna. He does not say what percentage of cases of purulent rhinitis finally become atrophic, but states that "in from five to ten years they finally develop into what is known as atrophic rhinitis." Whilst acknowledging that the pathological processes, which terminate as atrophic rhinitis with ozæna, generally start in infancy as a chronic purulent rhinitis, it cannot be allowed that all untreated cases of the latter will do so, for purulent rhinitis of childhood is a very much more common disease than atrophic rhinitis in after life. Other etiological factors which will be discussed later (p. 306) must be present. At the same time, it is a fact that a certain number of cases of purulent rhinitis may develop into atrophic rhinitis, and this renders the prognosis graver.

Treatment.—If there is any general condition underlying the local affection, appropriate remedies must be given, but if there are no special indications, cod-liver oil or arsenic, or both, may be administered with benefit. The preventive treatment of catarrhs should also be carried out (p. 196) to minimise the risk of exacerbations to which these patients are peculiarly liable.

Local treatment, however, is quite as important as general, and consists, in the first instance, in keeping the nasal passages absolutely clean and free from discharge. This is best effected by the use of Collunarium Alkalimum (p. 29) three or four times daily. For children under eight years it should be diluted with equal parts of water. As it is necessary to continue treatment for a very long time, it will be as well to change the wash occasionally, and as alternatives the following may be prescribed:—Collunarium Phenol Co. (p. 47), Collunarium Sanitas (p. 29), Collunarium Boro-glyceride (p. 29). These lotions should, if possible, be sniffed from the palm of the hand, but they may also be used by means of an irrigator, spray, or syringe. In infants the method suggested on p. 198 will be found useful.

After thoroughly cleansing the nose, a mild astringent should be applied. The Collunarium Hazelin (p. 49) is generally very useful as a spray. Bosworth recommends one of the following

lotions because they possess the property of controlling cell proliferation :—

Sulpho-carbolate of zinc	5 gr. = 2·06 gm.
Perchloride of mercury	$\frac{1}{20}$ gr. = 0·0032 gm.
Water	to 1 oz. = 30 c.c.

Or

Boric acid	30 gr. = 2·06 gm.
Water	to 1 oz. = 30 c.c.

Or

Collunarium Potassii Permanganatis (see p. 47).

If these methods are carefully and regularly carried out over very long periods, a great measure of success may be anticipated. Sometimes, however, even if atrophic rhinitis be averted, a chronic muco-purulent discharge may persist into adult life and be a source of inconvenience during the winter months and after acute catarrh. It can, however, always be kept in check by the use of cleansing lotions.

ATROPHIC RHINITIS OR OZÆNA

Definition.—A disease due to degenerative changes in the nasal mucous membrane, accompanied by abnormal patency of the nasal fossæ, and characterised by a profuse muco-purulent discharge which dries and forms crusts with a peculiarly offensive and characteristic foetor. Indeed the foetor is so characteristic in the fully developed stage that this symptom has caused the disease to be spoken of as ozæna (stench).

The above definition seems necessary, as the term atrophic rhinitis is used by some rhinologists to signify a condition of collapse of the vascular structures of the nose accompanied by deficient secretions, and the term ozæna is used by others to express any smell originating within the nostrils, as for instance that due to necrosis of bone. Ozæna is here restricted to the foetor due to the crusts occurring in connection with true atrophy of the intra-nasal structures.

Pathological Changes.—On examining the nose the vestibules are found to be devoid of vibrissæ, and the interior of the nose to be lined with hard greenish and offensive crusts which obstruct the view and hide the turbinated bodies. When these are removed the nasal fossæ are seen to be unusually wide, and it is often

possible to see clearly through to the posterior pharyngeal wall. The inferior turbinates are very small and often hardly visible, whilst the mucous membrane covering them is thin and collapsed. The middle turbinates sometimes share in the atrophy, but quite as commonly are apparently or really enlarged. Owing to the great patency of the inferior meatus, the whole width and often nearly the whole length of the middle turbinate can be seen, and it consequently looks abnormally large, but, allowing for errors from this source, there are a certain number of cases in which there is real hyperplasia. When this occurs, the mucous membrane covering the anterior end, though dry, is oedematous and often in contact with the septum, and the bone itself is also enlarged. Occasionally true polypi, generally single, are found attached to the middle turbinates, and, owing to the dryness of the cavities and the irritation of the crusts, they lose their usual grey shiny appearance, and become dry, red in colour, and firm to the touch.

Secondary changes are found in other regions. Thus the mucous membrane of the post-nasal space, pharynx, and larynx may become atrophied, dry, red, and shiny. The vault of the naso-pharynx is often covered with crusts, and the upper surface of the soft palate may be similarly affected, in which case the latter sometimes becomes stiff, and functionally defective. In the pharynx the mucous membrane looks particularly thin and shows the outline of the underlying vertebræ through it, and crusts may be seen on its surface. In the larynx the cords are often dry, red, and rounded, and large crusts may collect about the glottis, even to the extent of causing alarming and occasionally dangerous dyspnoea. The crusts may also extend for a considerable way down the trachea, or may form there whilst the larynx is free, causing considerable respiratory difficulty. The ears are often also involved. In some cases there is chronic dry otitis media, whilst in others attacks of acute otitis may occur from septic infection, which is often followed by chronic suppurative inflammation. Lastly, in about 18 per cent. of cases the accessory sinuses become infected.

Various other more remote pathological changes may be met with; for instance, in old-standing cases there is often a marked absence of lymphoid tissue in the naso-pharynx and pharynx (Wyatt Wingrave); carious teeth are very common, and a partial atrophy of the thyroid gland has been noticed.

Microscopical Changes.—The microscopical changes in the mucous membrane and inferior turbinate bodies have been fully investigated by Schuchardt, Valentine, and Wingrave, and may be summed up as follows:—

1. Replacement of the normal ciliated epithelium by squamous epithelium.
2. Degeneration, atrophy, and decrease in number of the glands.
3. Round cell infiltration, more particularly in the neighbourhood of the vessels and glands, and the formation of fibrous tissue.
4. Thickening of the small arteries and obliteration of the capillaries and vascular plexuses.
5. Atrophy of the inferior turbinate bone, but without any evidence of active bone disease.

In addition to the above changes, certain hyaloid bodies, occurring either singly or in clusters, have been noticed. These are probably due to cell degeneration, though it has been suggested that they are of the nature of psorosperms.

Etiology.—Three factors are essential to the production of the clinical condition known as atrophic rhinitis, namely, (a) atrophic changes of the mucous membrane; (b) abnormal width of the nasal passages; and (c) the presence of a muco-purulent discharge. These three essentials are met with as sequels to (1) purulent rhinitis of childhood, (2) syphilis, and (3) tuberculosis, all of which therefore may be looked upon as exciting causes of atrophic rhinitis, and must be considered more in detail.

1. *Chronic Purulent Rhinitis.*—Adherence has already been given (p. 303) to the view advanced by Bosworth that chronic purulent rhinitis of children is in many instances the first step in the pathological changes which are finally expressed in the condition known as atrophic rhinitis or ozæna, and it must be considered by far the most frequent and important exciting cause of the latter disease. Destruction of the cilia occurs early in purulent rhinitis, and if the inflammatory process persists, the columnar epithelium is replaced by squamous cells, and then probably there follow slowly all the microscopical changes which are met with in a well-established case of atrophic rhinitis, as enumerated above. Thus the first essential factor is produced. By no means all children, however, who suffer from chronic purulent rhinitis get atrophic

rhinitis, so there must be some other condition present, or soon established, which determines the development of the atrophic rhinitis in some patients and not in others. This condition is the second essential factor; namely, abnormal width of the nasal passages. Numerous explanations to account for this have been put forward, but the correct one is probably an arrest of development of the turbinated bodies caused by the chronic purulent rhinitis, and increased in some individuals by hereditary anatomical peculiarities. Zaufal first suggested that it was due to arrest of development rather than to atrophy, and if it be admitted that the disease starts in infancy, and amongst other things slowly leads to the formation of fibrous tissue, thickening of the small arteries, and obliteration of the capillaries, it seems reasonable to suppose that the small size of the inferior turbinates is due to starvation and arrest of development rather than to atrophic changes in a well-developed bone. If, added to this, there are anatomical peculiarities which increase the roominess of the nasal chambers, the second essential factor in the production of this disease will be well marked. As regards this anatomical peculiarity, it is met with in about 50 per cent. of cases of atrophic rhinitis. It is characterised externally by a broad, stumpy, upturned nose, sunk into the face, with thick, everted, and expressionless lips, and internally by unusual width of the nasal fossæ. According to Meisser, Hopmann, Gerber, and Wright, it is determined by the racial type of skull. Wide nasal fossæ are common in people whose nasal septa are short and whose post-nasal spaces are comparatively deep, and these conditions are a common accompaniment of platyrhinia or flat nose. Platyrhinia again occurs in broad-faced people who generally have the brachycephalic type of skull. Lastly, unilateral patency may be caused by deviation of the septum, and a unilateral ozæna result. Macdonald suggests that the abnormal patency is due to ill development of the maxillary antra, and concludes from experiments that the nasal fossæ vary in width inversely with the capacity of the antra. This is an interesting fact, but seeing that purulent rhinitis starts long before the maxillary antra have attained their full development, it seems likely that the causes which lead to arrested development of the inferior turbinates may also affect these accessory sinuses.

The third essential factor, namely, the existence of a muco-purulent discharge, is of course present from the very outset, being the chief symptom of muco-purulent rhinitis of childhood.

2. *Syphilis*.—This may produce the three factors essential to the production of ozæna. Extensive necrosis may render the nasal cavities abnormally patent, ulceration may destroy large tracts of mucous membrane, leaving scar tissue covered by squamous instead of the normal ciliated columnar-celled epithelium, and the attendant changes in the mucous membrane generally cause a muco-purulent discharge. This is retained and undergoes putrefaction, and ozæna is established.

It is necessary to distinguish clearly between active syphilitic processes, such as gummatæ, ulceration, and necrosis, in which purulent discharge, crusts, and the horrible stench characteristic of dead bone may occur, and atrophic rhinitis, which is a sequel to syphilitic destruction.

3. *Tuberculosis*.—Very rarely tuberculous ulceration or lupus may cause the same conditions and so lead to atrophic rhinitis.

Explanation of Ozæna or Stench.—Having considered the pathological and anatomical causes of atrophic rhinitis, the series of changes which finally result in ozæna or stench, the most distressing symptom, must be enumerated and further explained.

1. Inflammatory changes of the nasal mucous membrane occur, resulting in the secretion of a muco-purulent discharge in place of healthy mucus.

2. This is accompanied or followed by atrophic and degenerative changes in the epithelium and glands, which lead to stickiness and stagnation of the discharge, and to destruction of the ciliated mucous membrane.

3. The unusual width of the nasal fossæ, from either anatomical or pathological causes, renders the retention of the discharge almost inevitable, for the strength of the expiratory current becomes insufficient to drive the secretions before it. The same force which will cause a swift and forcible current in narrow passages, produces but a slow and feeble stream in broad channels.

4. As a consequence of the loss of cilia and the width of the nasal cavities, the discharges remain for long periods within the nostrils, become dry, and form large tenacious crusts. Being purulent these crusts are extremely apt to undergo putrefaction and give rise to stench. Various putrefactive bacilli have been found in them, the bacillus foetidus of Hajek and the bacillus mucosus of Loewenberg being the most important. Hajek maintains that the bacillus foetidus, when cultivated, gives rise to a greenish colour and a stench characteristic of ozæna, but it is more

probable that the peculiar odour is due rather to the character of the discharge than to any particular variety of bacillus.

5. The retention and putrefaction of the crusts cause fresh irritation to the nasal mucosa and a continuance of the discharge and thus of the disease.

Numerous other explanations, both of atrophic rhinitis and of its chief symptom ozæna, have been advanced from the days of the oldest Greek and Latin authors until now, but the etiology and pathology given above accord most fully with recent investigations, with clinical facts, and with the results obtained by treatment. Mention, however, must be made of the theory advanced by Grünwald. He maintains that the pus, the atrophy, the crusts, and the stench do not constitute a disease *sui generis*, but are all symptoms of suppurative disease of one or other of the accessory sinuses or other local focus. It is certainly true that the sinuses are involved in a certain proportion of cases of atrophic rhinitis, but by no means in all. In fifty cases investigated at the Throat Hospital the maxillary antra were found to contain pus in three instances, the sphenoidal in three, and the ethmoidal in two, that is, the sinuses were involved in 16 per cent. of the fifty cases, which is probably about the usual percentage. It is therefore more probable that disease of the sinuses is secondary to the disease in the nasal passages and due to infection. Against Grünwald's theory it may also be pointed out that the cycle of pathological changes which finally result in ozæna commence in children as a purulent rhinitis long before the sinuses are developed, and indeed ozæna itself may be fully established before the development of these latter cavities. These considerations contradict the idea that atrophic rhinitis and ozæna are but symptoms of sinus suppuration.

Predisposing Causes.—A few other predisposing causes must be taken into account, such as sex, age, hereditary tendency, and ill-health. As regards *sex* statistics show that atrophic rhinitis is very much commoner in females than in males. As regards *age* it is very difficult to determine when a case ceases to be one of purulent rhinitis and becomes one of atrophic rhinitis. The occurrence of crusts and foetor may be taken as a sign that the atrophic condition is well established, and undoubtedly the most common time for the commencement of these symptoms is at or about puberty; that is, from twelve to fifteen years of age, especially amongst girls.

As has been shown above, crust formation and foetor are due to retention of the discharge and putrefaction which occur directly there is inability to cleanse the nostrils by blowing the nose, and this in its turn depends upon the patency of the nasal chambers. The question, therefore, arises whether there are at the age of puberty any special causes at work which upset the balance between ability and inability to cleanse the nose by blowing. The question can be answered in the affirmative, as there are two distinct causes. Firstly, as already pointed out (p. 184), at the age of puberty the upper respiratory tract undergoes a rapid development out of proportion to the growth of the rest of the body, and hence there will be increased width of the nasal cavities. Secondly, in women the onset of these symptoms frequently coincides with the commencement of menstruation, which is often associated with temporary ill-health and anaemia. The inferior turbinates are always readily influenced by these conditions, becoming collapsed and dry, which in these cases may be just sufficient to prevent proper cleansing of the nostrils by blowing. Although puberty is very much the commonest age for these definite symptoms to appear, they often commence in earlier years and occasionally considerably later, especially in unilateral cases due to deviation of the septum and in post-syphilitic cases. *An hereditary tendency* is shown by the fact that atrophic rhinitis often occurs in more than one member of the same family, but it is probably the roominess of the nostril which is inherited rather than the disease itself. As regards *ill-health*, though the subjects of atrophic rhinitis are often otherwise in the best of health, it must be remembered that previous ill-health and unhealthy surroundings are often the cause of purulent rhinitis, and so indirectly of atrophic rhinitis. Cases of ozæna may occur in patients in whom there is some evidence of defective secretion of the thyroid gland, and it seems possible that the latter condition may act as a predisposing cause of atrophic rhinitis.

Symptoms.—The objective symptoms have already been given in discussing the pathology and etiology of this disease, and the subjective symptoms are few in number. The great trouble is the appalling stench which, though unnoticed by the patient, causes him to be shunned by his fellow-creatures. In addition to this the patient will complain of inability to smell, nasal obstruction and discomfort, and of dry throat or hoarse voice should the lower parts of the upper air passages be affected. There may be in-

digestion, or at all events a feeling of nausea, due to the putrefying discharges, whilst secondary ear affections are of common occurrence. Finally, there is also some evidence to show that subjects of atrophic rhinitis are unduly prone to become infected with pulmonary tuberculosis.

The **Diagnosis** is generally quite easy from the objective signs. Active syphilis with necrosis, the presence of a foreign body, and very exaggerated cases of simple dry rhinitis must be excluded.

The **Prognosis** is good as far as the relief of symptoms is concerned, but of course there can be no hope of restoring the inferior turbinate bone, whether it be atrophied or arrested in development, and no possibility of removing the permanent changes in the mucous membrane.

TREATMENT

Prophylactic Measures.—It has already been pointed out that in the great majority of cases this disease is a sequel of chronic purulent rhinitis which starts in infancy or childhood. The early recognition and prompt treatment of this condition is, therefore, of the utmost importance with a view of preventing atrophic rhinitis. For the treatment of purulent rhinitis, see p. 303, but emphasis must here be laid upon the fact that purulent rhinitis if not caused, is often kept up by the presence of adenoids, and the importance of their removal must be insisted on as a preventive measure. In the same way the early recognition and appropriate treatment of tertiary syphilis, congenital or acquired, is an important prophylactic measure, for if the disease is quickly got under control, extensive destruction will be prevented, and ozæna will be less likely to result. Lupus and tuberculous ulcerations should similarly be controlled whenever possible.

Treatment of the Disease.—Both local and general treatment must be adopted, but the former is by far the most important.

Local Treatment.—To render and keep the nose clean and to prevent the formation of crusts are the essential objects of all local treatment. If this can be successfully accomplished and continued for a sufficiently long time, the disease will at all events be arrested and the symptoms relieved; and, occasionally, a certain amount of repair of the damaged tissues will take place, which will go far towards producing a cure. This is especially likely to occur in young children and in recent cases.

It is not always an easy matter to cleanse the nasal cavities thoroughly, and in the first instance it can seldom be done efficiently by the patient. It should, therefore, be undertaken two or three times to commence with by the surgeon, and under his supervision until the patient can himself carry it out efficiently. It is best accomplished by syringing with a Higginson's syringe or with an indiarubber ball syringe. The syringing must be conducted with considerable care, as the foetid discharge is especially likely to cause acute otitis media, if forced up the Eustachian tubes. All the directions given on p. 29 for syringing a nose must, therefore, be carefully carried out. If the crusts seem very hard and tenacious they must be previously loosened with peroxide of hydrogen (p. 29). From time to time during the syringing the nose should be examined under good illumination and any small pieces of crust should be gently removed with forceps or pledgets of cotton wool, but in doing this great care is necessary in order to avoid injuring the mucous membrane. The cleansing should be thus continued until every particle of crust and all discharge has been removed.

Very many lotions have been recommended for use with the syringe, but as their object is only that of cleansing, some simple lotion is all that is required. The Collunarium Sanitas (p. 29) is most generally useful, but 2 drs. of Listerine may be substituted for the sanitas, or the Collunarium Alkalimum (p. 29), diluted with equal parts of water, may be used. Many of the lotions advocated seem actually harmful as being too stimulating.

After the cleansing has been satisfactorily accomplished the next step is to insert a long strip of cyanide or iodoform gauze into the nose, gently filling up the whole length of the inferior and middle passages. This serves to prevent the discharge from drying into crusts. Cotton wool soaked in olive oil also answers very well for this purpose and is preferred by some patients.

This completes the first dressing and the process should be repeated by the surgeon every twenty-four hours for a few days, but in the intervals the patient must attend to it himself. The packing should be allowed to remain in position for from eight to twelve hours, after which it is gently withdrawn, the nose washed, and fresh packing inserted. For cleansing the nose the patient should use a small ball syringe with a nozzle giving a divided stream (Fig. 149), and for a lotion he may be directed to add half a teaspoonful of salt and two teaspoonfuls of sanitas to

a tumbler of warm water, whilst for the insertion of the gauze he should be provided with a thick probe, and for its withdrawal with a pair of nasal forceps. If there is any difficulty in removing the gauze, owing to its having stuck to the mucous membrane, the patient should allow the syringe to play on it whilst pulling it out; and, after the washing and before re-packing, the nose should be sprayed with some oily preparation, such as 10 grs. of menthol to the ounce of paroleine, or eucalyptus oil (one part to twenty of almond oil), or the gauze itself may be soaked in one of these preparations. After the first few days the patient may continue this treatment with only occasional supervision, changing the gauze and washing the nose night and morning, and, if necessary, in the middle of the day.

Some patients tolerate the packing very well and are able to use it constantly, whilst others find it very trying, in so far as it prevents nasal respiration and often interferes with sleep. When such is the case, the quantity of gauze may be at first limited, allowing of a certain amount of nasal breathing, or the patient may be encouraged to wear the packing for half-an-hour at a time to commence with, and to increase the period and the frequency of the packings gradually; or again, each nostril may be packed alternately for periods of eight hours, until toleration is established.

Duration and Results of Treatment.—This method of treatment from the very first entirely prevents the retention, drying, and putrefaction of the discharge, and thus the patient is at once relieved of the worst symptom of the disease, namely, the foetor. It must, however, be continued for many months and occasionally even for years before any permanent benefit can be expected; but eventually, if conscientiously carried out, there will be some progress towards recovery. After a period varying from two to six months it is generally possible to leave off the packing, though the lotions will have to be continued very much longer. But after a time the frequency of the washings may also be lessened; at first the



FIG. 149.—Nasal syringe.

mid-day syringing may be abandoned, then perhaps the evening, until at last, in a really successful case, a thorough cleansing of the nose once every day will keep the parts clean. In such cases the roominess of the nasal cavities and the atrophy persist, but the discharge practically ceases or becomes mucous in character, so that, even if it does dry, the crusts are not likely to become foetid. In spite of this the case cannot be said to be cured, for an acute fever or a severe catarrh may at any time again set up a purulent discharge, and lead to a return of symptoms, because the predisposing cause, namely, abnormal patency, is still present. Any recurrence can, however, be speedily cut short by at once returning to the above treatment in all its details. As already pointed out, in a few cases, especially in young children or where the disease has only existed a very short time, there may be sufficient repair of the damaged tissues to result in permanent relief of the symptoms.

General and Constitutional Treatment.—Very often the victims of atrophic rhinitis are otherwise in the best of health and no general treatment is necessary; but, on the other hand, they may be anæmic, or mentally depressed owing to the consciousness that they are shunned on account of the stench of their breath. The local treatment, if properly carried out, will soon relieve the patient of this source of depression, and regulation of the bowels and the administration of iron will help to correct the anæmia. In delicate children cod-liver oil and iron are generally useful.

Residence at the seaside, sea-bathing, and the local use of sea water as a douche have long been looked upon as useful adjuncts in the treatment of ozæna. The boggy marshes about the Bristol Channel are said to be beneficial on account of the bromo-iodine vapours arising therefrom.

Treatment of Complications.—1. *In the Post-nasal Space, Pharynx, and Larynx.*—The post-nasal space is generally full of crusts, and it is very important to clear them away and afterwards keep the space clean. The syringing of the nose may be sufficient to accomplish this, but if on inspection some crusts are seen to be left behind after the anterior nares have been successfully cleaned, the post-nasal syringe should be used and continued until all the crusts have disappeared. Afterwards the plugging of the nose will prevent the re-formation of crusts in the post-nasal space. The pharynx, when involved, should be cleansed by

means of a spray or swab of cotton wool. Either salt and sanitas or diluted alkaline lotion may be used for both nasopharynx and pharynx. If in spite of this treatment the parts remain dry with a tendency to crust formation, they may be gently painted with Mandl's solution once a day after cleansing. In the same way, if the larynx is involved, it should be cleansed by means of a spray of alkaline lotion as often as may be necessary to keep it clean, after which the Vapor Cubebæ should be used. The chief factor in the cure of the pharynx and larynx is, however, the efficient treatment of the nose. If this is kept clean and free from crusts, the lower parts tend towards spontaneous recovery.

2. *Ear Complications*.—Here again the most important point in the treatment is to render the nose aseptic and to free it from obstructing crusts. Apart from this, there are no special indications for the treatment of ear complications in atrophic rhinitis. They must be dealt with on general principles.

3. *Sinus Suppuration*.—If any of the accessory cavities become infected they must at once be treated in exactly the same manner as that recommended in Chapter x., for the complete cure of a case of ozæna cannot be expected as long as pus, which readily undergoes putrefaction, is being poured into the nose from a sinus. There is one point specially worth mentioning here, and that is the ease with which a sphenoidal sinus may be dealt with in some of these cases. Owing to the atrophy of the turbinated bodies, it is often possible to see the ostium of the sinus with pus oozing from it and running down over the base of the sphenoid. In such cases the ostium can easily be enlarged with suitable cutting forceps until the whole of the antero-inferior wall has been removed. The free drainage thus established and the cleansing of the cavity generally succeed in arresting the suppuration (p. 293).

4. *Enlargements of the Middle Turbinate and Polypi*.—The advisability of removing these abnormalities is doubted by many authorities, as it is supposed that they in some measure compensate for the atrophy of the inferior turbinates, and consequently that their removal only adds to the dryness and increases the difficulty of the expulsion of the discharges and crusts. It must, however, be remembered that they are evidence of past or present disease, and are therefore likely to be a source of irritation and unhealthy discharge. If there are signs of active bone

disease or suppuration of a sinus these conditions should be at once actively treated. Polypi can be removed without any fear of aggravation of the symptoms, if the nose is afterwards efficiently packed, but if there is a single polypus without signs of active disease it may be left alone. Enlargements of the anterior end of the middle turbinate should be removed whenever they cause irritation or interfere with the proper drainage of a sinus.

5. *Deviation of the Septum.*—In nearly all cases of unilateral atrophic rhinitis deviation of the septum towards the unaffected side will be found. It is a difficult question to decide whether the deviation has caused the atrophic condition on the patent side or whether it has saved the narrow side from sharing the fate of the patent side. In flat broad-nosed people the latter is the more probable, and therefore the deformity should on no account be interfered with. In narrow-nosed people, on the other hand, the deviation, by causing too great a width in the affected nostril, must be looked upon as one of the factors in the production of the atrophic condition. Nevertheless it is better, in the first instance at all events, to leave the septum alone. The case should be carefully treated by cleansing and packing until crusts have for a long time ceased to form and until the secretions have become mucous instead of muco-purulent. Then, if there is great obstruction of the unaffected side, the deflection may be corrected, so as to save the affected nostril from doing double respiratory duty. It is better, however, to limit any operative measures to manipulations which can be carried out without dividing the mucous membrane of the atrophic side. If, in addition to deviation, there is any considerable thickening of the cartilage, this may be removed, especial care being taken not to cut through to the opposite side and so cause a perforation. If there is no such thickening, a submucous resection of the deviated cartilage may be undertaken. (See pp. 328 and 340.)

Other Methods of Treatment.—Numerous other methods of treating atrophic rhinitis have been recommended from time to time, some of which are useful, not as replacing the cleansing method, but as adjuncts to it, whilst others cannot be looked upon as anything but harmful. A few of the better known methods may be mentioned.

1. *Submucous Paraffin Injection.*—Lately the submucous injection of melted paraffin, as suggested by Brindel and Lake, has been frequently carried out in order to counteract the

atrophic condition of the inferior turbinate. The paraffin should have a melting-point of 105° F., and from a half to two drachms are required. Experience shows that it is better to inject a small quantity at two or three sittings rather than a larger quantity at one sitting, and also that it is better to start at the posterior end of the inferior turbinate. It is difficult and sometimes impossible to carry out if the turbinal is very small. Lake's syringe for the purpose is convenient (Fig. 150). The technique of the operation is the same as for other paraffin injections (p. 160). The procedure certainly seems to give considerable subjective relief to the patient, and may shorten the period during which it is necessary to pack the nose. It can apparently be carried out without danger to the patient, the only ill result being temporary oedema under the eyes with some pain



FIG. 150.—Lake's paraffin syringe.

and tenderness, which soon pass off. In suitable cases it may certainly be tried as an adjunct to the routine method of treatment.

2. *Vibratory Massage*.—This consists in stimulating the nasal mucous membrane, and especially that of the inferior turbinate, by means of mechanical friction. A small piece of cotton wool is twisted on a probe, with which the parts are lightly but rapidly rubbed backwards and forwards. It can be applied better by an instrument, especially adapted for the purpose, attached to an electro-motor, but in the absence of this, the rapid movements of the hand act very well. The friction should be continued for three or four minutes at a sitting and repeated at first daily and then less frequently. This method of treatment certainly acts advantageously, probably by squeezing the secretions out of the gland ducts and thus assisting in the process of cleaning, and if continued sufficiently long it also increases the vascularity of the inferior turbinated bodies and produces a flow of watery mucus, whilst eventually some permanent increase in the size of the inferior turbinate may be obtained. The objection to the method is that

the massage must be applied by the surgeon, thus necessitating much inconvenience and expense to the patient. It should, of course, only be used as an adjunct to the treatment above advised, and should certainly be employed after washing the nose so long as the surgeon is himself undertaking the cleansing of the parts.

3. *Cupric Electrolysis*.—This method was first introduced by Jouslain and afterwards tried and recommended by Cheval, MacBride, and Yonge, but further experience has shown that the results are not what were at first expected and it is doubtful whether the method affords any permanent relief. The details of applying cupric electrolysis are thus described by MacBride: "The parts are thoroughly cocainised after the nostrils have been freed from crusts; the copper needle attached to the positive pole of a battery is then inserted into the inferior or middle turbinate body, while a platinum (or steel) needle connected with the negative pole is then plunged into the septum. A current of from 3 to 10 milliampères is allowed to pass for about ten minutes. . . . It is often desirable to repeat the operation more than once on each side at intervals of a fortnight."

4. *The Application of the Constant or Interrupted Electric Currents to the Nasal Mucous Membrane*.—These methods have their advocates, who maintain that thereby the dry and bloodless mucous membrane is stimulated into activity. In some early cases their gentle use may be of some service, but any strong stimulation of an atrophied part is unreasonable and harmful. Great caution is therefore necessary, as over stimulation must in the long run increase the condition it is designed to relieve, and the final result will be further atrophic changes. Physiological rest and soothing applications seem to be a more rational form of treatment.

5. *The Electric Cautery*.—It has been recommended that the mucous membrane should be superficially seared by the cautery, or that the various spots to which the crusts adhere should be destroyed. This practice must be unhesitatingly condemned.

6. *Curetting the Diseased Parts*.—It has also been suggested that the diseased mucous membrane should be removed by curettement, but, considering the pathology of the disease, the rationale of the suggestion is difficult to understand. Operations of this sort seem most unadvisable.

7. *Gottstein's Method*.—This consists of introducing into the nose large plugs of cotton wool, with the object of causing irritation and an increased flow of mucus. In effect it is similar but

inferior to packing the nose with strips of gauze, and probably really acts by giving functional rest to the passages.

8. *MacDonald's Tampons*.—MacDonald recommends the insertion into the nostrils of specially manufactured tampons or pieces of cotton wool sufficiently large to obstruct nasal inspiration partially but not completely, and maintains that if the patient will persist in breathing through the nose in spite of this obstruction, a minus air tension is produced within the nasal cavities leading to a filling of the blood vessels and secondarily to a flow of mucus. To be of any service at all it must be persisted in for several hours a day, to which patients strongly object, and even then the results do not seem to be of a lasting nature. Probably such good as does result is more due to the physiological rest produced by modifying the amount of air passing through the nose, than to the production of a diminished air tension.

9. *Blisters, Caustics, and strongly stimulating Paints*.—Such applications have been recommended from time to time, but enough has already been said to show that they are harmful, even if at first they seem to produce some benefit.

10. *Anti-toxin Treatment*.—Upon the supposition that a bacillus often found in cases of ozæna was an attenuated form of the Klebs-Loeffler, Belfanti and Della Vedova suggested the injection of diphtheria anti-toxin for the cure of ozæna. It has now been extensively tried on the Continent, and though in many cases it has apparently done good, it has nevertheless been abandoned as being uncertain and not free from danger owing to the size and frequency of the dose required to produce an effect.

11. Low has recommended the internal use of mucin combined with its application locally, and claims success for the method.

12. An endless number of *Local Remedies* have been suggested for the cure of ozæna, a few of the most useful of which may be mentioned. Some of them may be substituted for, and others used in addition to, the salt and Sanitas solution recommended above.

1. Lotions.

Collunarium Potassii Permanganatis (see p. 47).

Creolin 1 per cent. in water.

Ichthyoil 2 per cent. to 5 per cent.

Perchloride of mercury . . 1 in 3000 (Baber).

Formaline 1 in 2000, gradually increased in strength (Bronner).

Aceto-tartarate of aluminium. 50 per cent. solution, of which a tea-spoonful to a pint of water is used at first, and the strength gradually increased. This is strongly recommended by Schäffer and MacBride.

Tincture of sanguinaria 1 to 6 parts in 1000 parts of water.

2. Paints.

Ichthyol 25 per cent. to 30 per cent. in liquid paraffin.
 Mandl's fluid See p. 38. (Pegler.)
 Camphorated naphthol Made by heating 1 part of naphthol with
 2 of camphor. This generally re-
 quires dilution with vaselin.
 Chloride of zinc 1 per cent. in water (Grant).

3. Insufflations.

Iodoform 1 part, starch 1 part.
 Idol 1 part in 7 of starch.
 Boracic acid.
 Aristol.
 Camphor.
 Citric acid With equal parts of sugar of milk.

RHINITIS CASEOSA

Definition.—A rare disease characterised by an accumulation within the nose of a cheesy material having an extremely foetid and characteristic odour.

Etiology.—The cause of this trouble is not definitely known, but it is said by some to be connected with tubercle or syphilis, and by others it is thought to be a sequel of influenza. It is probably in some way due to chronic rhinitis associated with a purulent or muco-purulent discharge, which for some reason is retained in the nasal cavity.

Pathological Changes.—With the exception of the collection of foetid cheesy matter within the nose, usually on one side only, there are no very characteristic pathological changes. The mucous membrane usually shows signs of inflammation, and in some cases it has been found to be highly vascular and polypoid, and to bleed on the slightest touch with a probe. The cheesy material may be found within the antrum, and may be sufficiently abundant to distend its walls, whilst the collection in the nasal fossæ may cause actual displacement of structures and facial deformity. Microscopically fatty cells, granular leucocytes, stearin and cholesterin crystals are

found, but as a rule no special micro-organisms beyond those of putrefaction, though some authorities have found the *streptothrix alba*. In a case recently reported by Edmunds the deposit consisted of a mass of needle-shaped crystals of calcium phosphate embedded in a granular mass of detritus. He suggests that the condition may be comparable to chronic catarrh of the gall bladder accompanied by the formation of calculi composed of calcium compounds.

The **Symptoms** are those of nasal obstruction and discharge, with headache. The patient loses the sense of smell, but the friends notice the foetor of the caseous material.

Treatment.—In slight cases local anaesthesia should be induced and the cheesy material removed as far as possible with a spoon, and then the nasal cavity should be syringed with boric lotion until all the material has been washed out. In the more severe cases a general anaesthetic should be administered, and the nasal cavity thoroughly emptied of all the cheesy material by means of a curette or spoon. The finger is introduced into the nose and the outer wall examined for any unusually large opening into the antrum. If such an opening is found, the finger is passed within the cavity to determine whether it also is filled with the same material. If this is the case, it should be emptied with the spoon.

The after-treatment consists in cleansing the affected nasal chamber with the alkaline lotion two or three times a day.

The result of these manipulations is generally very satisfactory. If the nose has been thoroughly emptied, there is no further accumulation of cheesy material.

CHAPTER XII

AFFECTIONS OF THE SEPTUM AND ALÆ NASI

I. SPURS AND DEVIATIONS: *Etiology—Pathological Changes—Symptoms—Treatment;* A. Of Spurs, Cartilaginous and Bony.—B. Of Simple Deviations—Gleason's, Moure's, Asch's, and other Operations.—C. Of Deviations combined with Spurs—Removal of Spur and Deviation—Killian's Operation—Krieg-Bönnighaus' Resection.—D. Of Dislocation of Anterior Triangular Cartilage. **II. HÆMATOMA AND ABSCESS.** **III. PERFORATIONS.** **IV. ADHESIONS.** **V. COLLAPSE OF THE ALÆ NASI.**

THE septum and alæ nasi may be involved in many of the acute and chronic inflammatory diseases of the nose and in acute and chronic infective diseases, and they may also be the seat of simple or malignant tumours; but as the locality does not alter the general characteristics of the disease, no special description is required.

In this chapter, therefore, the following conditions only will be described:—

- I. Spurs and Deviations of the Septum.
- II. Hæmatoma and Abscess of the Septum.
- III. Perforation of the Septum.
- IV. Adhesions of the Septum.
- V. Collapse of the Alæ Nasi.

I. SPURS AND DEVIATIONS

Definition.—A spur is a cartilaginous or bony ridge on, or a local thickening of, the septum. A deviation is a bending of the septum from the middle line producing inequality of the nasal cavities. Either may occur alone, though very often they coexist.

The septum is formed behind and below by the vomer, behind and above by the perpendicular plate of the ethmoid, and in front by the anterior triangular cartilage (Fig. 151). This last is the part principally involved in septal deformities.

Etiology.—More or less deviation of the septum with or without thickening occurs according to Mackenzie's investigations, which have been corroborated by others, in as many as 76.9 per cent. of skulls, and the etiology of such a common deformity is of very

great interest. At the present time there are innumerable theories as to its causation, but few ascertained facts. It is possible that, if facts predominated over theories, something might be done in the way of preventing the more aggravated forms of these conditions.

Without entering into the details of the various theories, it may be said that probably the majority of simple deviations are

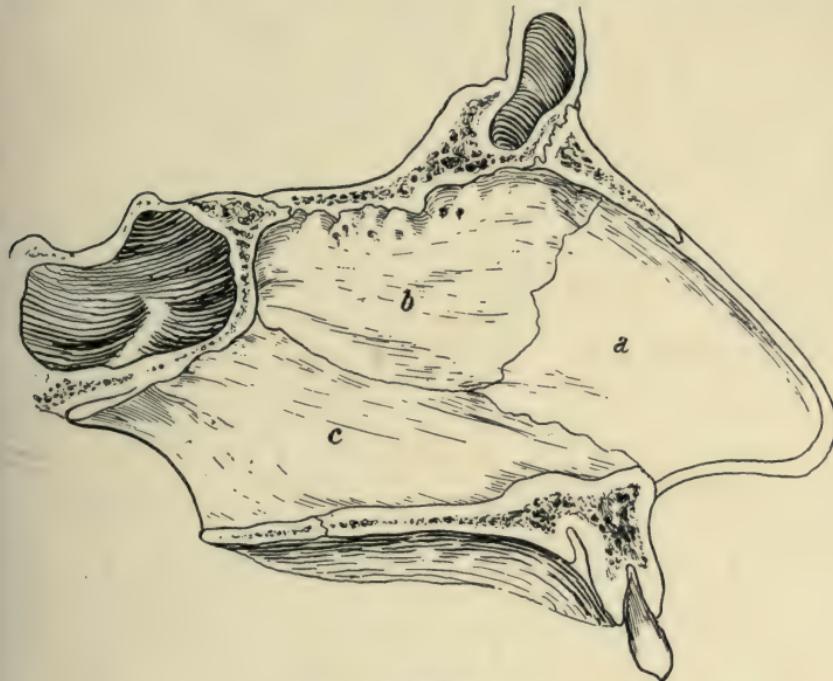


FIG. 151.

- a. Anterior triangular cartilage.
- b. Perpendicular plate of the ethmoid.
- c. The vomer.

developmental in origin, though in some instances when confined to the cartilaginous septum they may be the result of injury; that spurs of the cartilage are usually traumatic, whilst those following the line of the ethmo-vomerine suture are developmental; that deviations combined with spurs are either solely traumatic in origin or the result of irregular development and injury combined.

That blows on the nose should cause perichondrial or periosteal inflammatory changes leading to localised thickenings, or should cause or exaggerate deviations, is easy of comprehension, but it is not so easy to understand the developmental origin of deviations. There are, however, two clinical facts which suggest an

explanation. Firstly, deviations of the septum are almost always associated with high-arched palates; and secondly, high-arched palates are nearly always associated with some form of nasal obstruction during childhood, especially with adenoids in the naso-pharynx. These clinical facts suggest that adenoids, deformity of the palate, and deviation of the septum are in some way etiologically connected.

In the first place it may be stated fairly definitely that very many instances of deviation are due to the high-arched palate. The septum is thin and yielding, especially its cartilaginous part, compared with the base of the skull above and the hard palate below, between which it is wedged; and if the vertical dimensions of the nasal cavity are diminished by a high-arched palate, the septum during its development must bend to one side or the other.

The next point to consider is whether there is any causative relationship between the high-arched palate and adenoids, which coexist so frequently. It was at one time thought that the high arch of the palate was congenital, and that, by causing nasal obstruction, it was one of the causes of adenoids. But this view has been generally abandoned, and it is now thought that the adenoids or any other form of nasal obstruction in young children are the cause of the deformity of the palate. It has often been suggested that the alterations in the shape of the upper jaw were caused by the dragging of the buccal muscles due to the open mouth and buccal breathing in young children with nasal obstruction. Recently Lack has been able to corroborate this view to some extent by finding, in a boy with old-standing unilateral facial paralysis and old adenoids, the typical changes in both upper and lower jaws on the sound side, whilst on the paralysed side there was hardly any noticeable alteration in shape. The question of the etiology of deviation of the septum may therefore be thus summarised:—Adenoids, or other forms of nasal obstruction, cause open mouth and buccal breathing; the consequent dragging of the buccal muscles causes in young children a pinching in and pushing up of the palate (see Figs. 182 and 183); and the pushing up of the palate, by diminishing the vertical dimension of the nasal cavities, leads to bending of the septum during its growth. If this view is correct, the early removal of adenoids or other form of nasal obstruction may prove to be preventive of deformities of the palate and septum.

Pathological Changes.—The chief groups of septal deformities, as already mentioned, are (1) simple spurs, (2) simple deviations, and (3) deviations combined with spurs or thickenings. *Spurs* usually take the form of crests, spines, or rounded thickenings, confined to the cartilaginous septum, and are generally themselves cartilaginous, though sometimes they become partially ossified. They usually run in an antero-posterior direction parallel to the

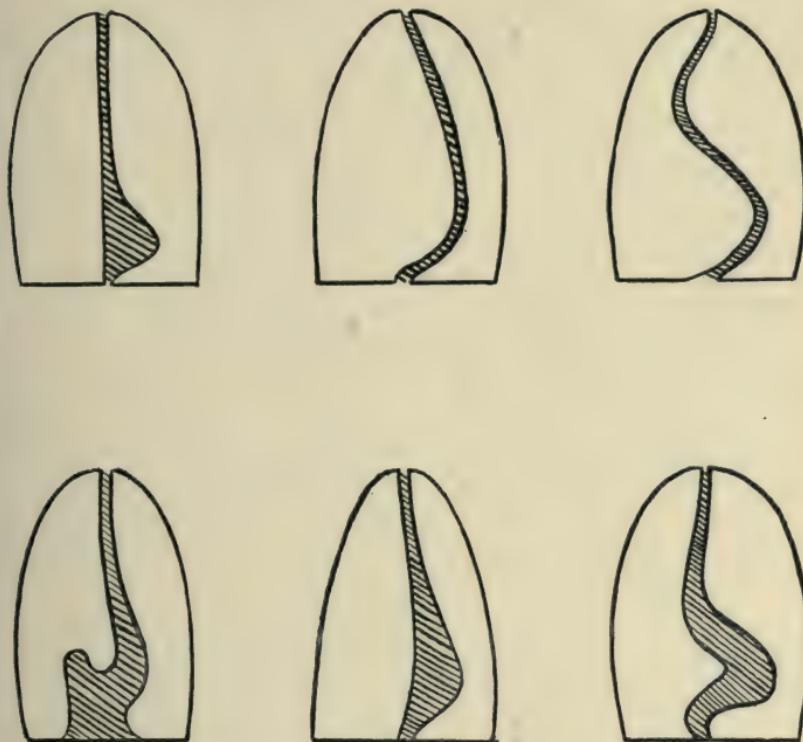


FIG. 152.—Spurs, simple deviations and deviations with thickening of the septum.

floor of the nose, though sometimes they take a vertical direction. A somewhat common spur occurs on the bony septum, starting just behind the triangular cartilage. It follows the junction of the perpendicular plate of the ethmoid with the vomer and runs in an upward and backward direction, and it projects from the septum more and more as it extends backwards.

Deviations occur rather more frequently towards the left than the right side of the nose, and though they are perhaps usually confined to the cartilaginous septum, the anterior part of the bony septum is not uncommonly more or less involved. The posterior

end of the vomer, however, is very seldom out of the middle line. The shape and extent of deviations vary greatly. They are spoken of as curved or angular, as C-shaped, S-shaped, zigzag or crumpled, and they may be more pronounced in either the vertical or antero-posterior direction. The accompanying diagrams will explain better than words some of the varieties which may be met with (Fig. 152).

Dislocation of the Triangular Cartilage.—In addition to the above varieties, bending and thickening of the anterior end of the triangular cartilage to one side or the other is a fairly common

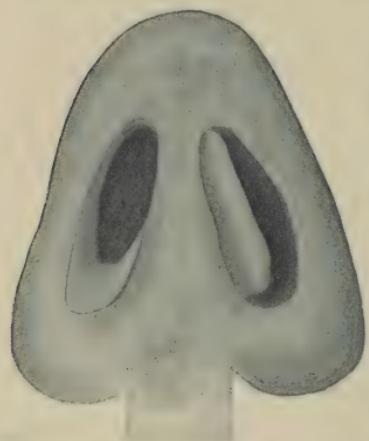


FIG. 153.—Dislocation of the anterior cartilage of the septum.

deformity. It is generally caused by a blow, and is frequently seen in boxers. It is of importance, because it may cause considerable obstruction to nasal respiration. It is generally visible without any special examination, and can always be brought into view by tilting the tip of the nose upwards (Fig. 153). In addition to this, Bosworth describes dislocation of the columnar cartilage, and Pegler dislocation outwards of the mesial crus of the lower lateral cartilage in the columnna nasi.

On examination of the nose the signs of *chronic rhinitis* can often be observed in addition to the septal deformity. The inferior and sometimes the middle turbinals may be considerably enlarged and greatly add to the obstruction. Great turgescence and even excessive hyperplasia of the inferior turbinal on the roomy side of the nostril will often be observed. This may be due to a catarrhal inflammatory process, but very often it seems as if it were in some way compensatory.

Symptoms.—Perhaps the majority of septal deformities cause no symptoms and do no harm, but on the other hand they may be productive of serious local and general complications. The symptoms which may arise can be divided into those directly due to the particular abnormality present, and those dependent on the consequent nasal obstruction. Of the former the following may be mentioned:—1. External deformities of the nose, such as bending of the cartilaginous part of the bridge from the straight line, deflection of the whole nose from the middle line, or in-

equality of the nostrils. 2. Neuralgia, often severe, from pressure of the turbinals against the deviated septum (p. 230). 3. Hay fever, paroxysmal sneezing with rhinorrhœa, and sometimes asthma from irritation due to the deformity. 4. Epistaxis, due to the formation and separation of crusts which form where the dust-laden air impinges on the prominent part of the deformity. 5. Obstruction of one or more of the openings of the accessory cavities. 6. Simple dry rhinitis on the unobstructed side.

The symptoms due to the nasal obstruction are, shortly stated, buccal breathing with secondary pharyngitis and dry throat, laryngitis, tracheitis; disturbed sleep, headache and mental inability, and a nasal timbre of the voice. More or less chronic rhinitis is commonly present, due to persistent hyperæmia behind the seat of obstruction, and interference with the drainage of the secretions. Chronic otitis media is also associated with nasal obstruction of this origin. It is generally due to spreading of the chronic catarrhal inflammation to the Eustachian tubes and thence to the middle ear, though when both nostrils are obstructed it may be in part due to alteration of the air tension in the tympanum.

Diagnosis.—The diagnosis is as a rule obvious. Turgescence of the mucous membrane along the lower part of the septum may resemble a spur, and a diffuse gumma a deviation. Careful examination with a probe will, however, prevent any mistake.

TREATMENT

As already stated, the majority of spurs and slight deviations are productive of no harm whatever and should be left alone, but active treatment is called for under any of the following circumstances :—

1. Nasal obstruction with secondary chronic rhinitis, chronic otitis media, or chronic catarrh of the pharynx and larynx, trachea, or bronchi.
2. Nasal neuroses, such as hay fever, paroxysmal sneezing and rhinorrhœa or asthma, if there is no other more probable cause.
3. Interference with other treatment, such as passing a Eustachian catheter, removal of polypi, or exploration and treatment of an accessory cavity.

Often the symptoms are really due to chronic rhinitis, which

is aggravated by the presence of a septal deformity. When this is so, the rhinitis should be treated on the lines already recommended. Simple lotions and sprays are first tried (p. 216), and if these are not sufficient, tumefaction of the inferior turbinal should be reduced by means of cautery (p. 217) or true hyperplastic out-growths removed (p. 225). Occasionally when the inferior turbinal is greatly enlarged and inflamed, amputation of its anterior end is indicated (p. 219), but a healthy turbinal should never be removed instead of the septal deformity.

In other cases it is obvious that the spur or deviation is the cause of the obstruction and other symptoms, and that the chronic rhinitis is quite a secondary condition. Here, though the catarrh should be treated, the most important therapeutic measure is to restore the air-way by operative measures.

Operative Treatment.—Operative measures may be divided into those for simple spurs, those for simple deviations, those for deviations and spurs combined, and those for dislocations of the anterior triangular cartilage.

A. Spurs.—These may be removed with knife, spokeshave, or saw either under general or local anaesthesia, and either with or without the preservation of the mucous membrane. A knife or spokeshave is best when the spur is cartilaginous, but, when bony, a saw will be necessary. The operation is undoubtedly easier under local anaesthesia, which is sufficient when the spur is cartilaginous; but when bony, general anaesthesia is usually necessary. The mucous membrane should be preserved when the raw surface left after the removal of the spur will be of large extent and situated in the anterior part of the nostril, because in this situation troublesome crusts are more liable to form.

A *Cartilaginous Spur* should therefore as a rule be removed in the following manner:—Local anaesthesia is induced by the application of a solution of cocaine and supra-renal extract (p. 63).



FIG. 154.—Knife for the septum.

An incision is made with a narrow-bladed knife along the lower border of the spur down to the cartilage, and the muco-perichondrium is separated upwards, and a little downwards if necessary, by means of an elevator. If there is much haemorrhage, it

should be arrested by pressure with cotton wool swabs. When a clear view can be obtained, a short-bladed blunt-pointed knife, with the cutting edge slightly concave (Fig. 154), is introduced below the spur, and the projecting ridge of cartilage cut off to the exact

extent required to restore a free air-way. If preferred, a spokeshave, such as recommended by Moure (Fig. 155), may be used instead of the

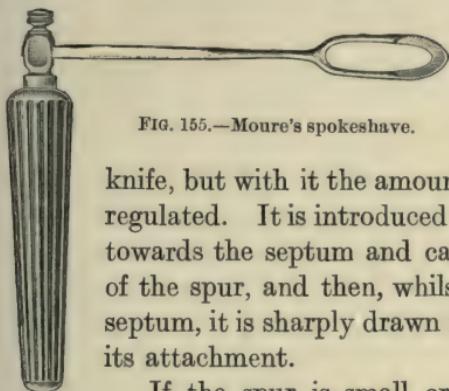


FIG. 155.—Moure's spokeshave.

knife, but with it the amount removed cannot be so exactly regulated. It is introduced with the convex cutting surface towards the septum and carried behind the posterior end of the spur, and then, whilst being held firmly against the septum, it is sharply drawn forward, severing the spur from its attachment.

If the spur is small or if the patient is nervous, the mucous membrane may be sacrificed. The ultimate result is equally good, but healing will take a little longer.

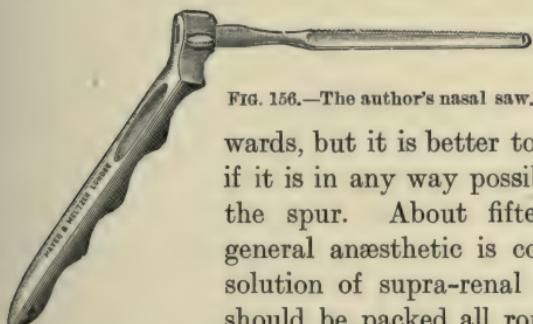
Bony Spurs should be removed under a general anæsthetic by means of a saw. The saw must be sharp and rigid. One after Bosworth's pattern, only a little shorter in the blade and less flexible than they are generally made (Fig. 156), answers all

the requirements. By reversing the blade in the handle the saw will

FIG. 156.—The author's nasal saw.

cut from above downwards, but it is better to cut from below upwards if it is in any way possible to introduce it below the spur. About fifteen minutes before the general anæsthetic is commenced a 5 per cent. solution of supra-renal extract on cotton wool should be packed all round the spur to contract the mucous membrane and control the bleeding.

The cotton wool must be removed before the anæsthetic is commenced for fear it should slip back and find its way into the larynx. Gas and ether or A.C.E. mixture is then administered, and the operator, standing on the patient's right-hand side, throws a good light into the nose and introduces the saw along the floor below the spur with its cutting edge towards the septum. The actual sawing is commenced in this direction and then gradually curved upwards. By rapidly working the saw backwards and



forwards without too much pressure the spur is soon divided, but often remains adherent to the septum by a tag of mucous membrane. The divided portion should be grasped with polypus forceps and the tag divided with scissors. This is sometimes difficult and, if one or two attempts prove unsuccessful, the spur may be twisted off with forceps. If the spur reaches far forwards, the mucous membrane should be first reflected from the spur and preserved.

Very little *after-treatment* is necessary after the removal of either cartilaginous or bony spurs. The nose is kept clean by means of the alkaline wash, which should be used two or three times daily; and if the mucous membrane has been removed, the wound should be well oiled with Nebula Menthol (p. 44) after each washing, applied with a brush or as a spray. During these operations there is always the possibility of wounding the opposing surface of the inferior or middle turbinals, and therefore a watch should be kept for the possibility of adhesions, and preventive treatment adopted if necessary (p. 71).

The results of these operations are usually quite satisfactory. After the first twenty-four hours a great deal of inflammatory swelling occurs which may cause as much obstruction as did the spur, but in the course of a week or so the swelling subsides and the patient experiences great comfort from his newly found air-way. Occasionally, however, the inflammatory swelling becomes organised and permanent, and the final result is unsatisfactory.

B. Simple Deviations.—The operative treatment of simple deviations must vary according to the size of the nasal fossæ. If their combined width is about normal, certain procedures may be adopted, which would be useless in unusually narrow nasal passages. Operations suitable to both conditions will, therefore, be described.

(a) *When the Combined Width of the Fossæ is Normal.*—It is obvious that if the inferior and middle turbinates are much enlarged on the wider side of the nose, the septum when straightened may be brought into contact with them, and so give rise to obstruction. To them therefore in the first instance must treatment be directed. When simple turgescence of the inferior turbinal is present, sufficient can often be done by the use of the cautery (p. 217), but in marked cases it may be necessary to amputate its anterior end (p. 219). If there are hyperplastic outgrowths these should be removed (p. 225). It is also very important to

examine the post-nasal space to see if the posterior ends are enlarged and causing obstruction, and, if so, to remove them (p. 221). If this is neglected, troublesome stenosis may persist after the septal deformity has been rectified. If the middle turbinal is enlarged and likely to cause obstruction when the septum is pushed over, the anterior end should be amputated (p. 233). The turbinals on the obstructed side may also require attention.

Having thus cleared the way, the actual straightening of the septum may be undertaken. There are several operations which answer very well, but the simplest one applicable to the particular case, and the one which will entail the least worry to the patient in its after-treatment, should be selected. Gleason's, Moure's, and Asch's operations will be described here, but Killian's sub-

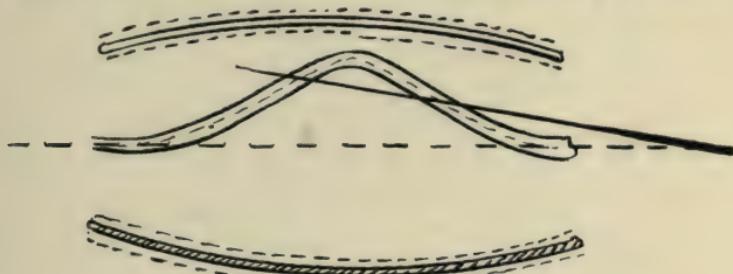


FIG. 157.—Faulty incision through the cartilage.

mucous resection (p. 340) is suitable in some cases and gives good results.

Gleason's Operation.—This consists essentially in making a U-shaped cut through the deviated part of the septum from its convex side, in pushing the flap of cartilage with its mucous membrane over to the patent side of the nose, and in retaining it in position until healing is complete. It is often possible to do this under local anaesthesia, but occasionally considerable force is required to push the flap over to the opposite side, and therefore it is generally better to give gas and ether. The following are the steps of the operation:—When the patient is under the influence of the anaesthetic, his head is turned towards the operator, who stands on the right side of the table, and the obstructed nasal cavity is illuminated. A nasal saw is introduced below the convexity of the septum close to and parallel with the floor of the nose, with its cutting edge towards the opposite side. The cutting is commenced in this direction and so continued until the saw has penetrated into the cartilage or bone, when the direction

is gradually changed until it becomes vertical. The saw must be kept absolutely straight in the antero-posterior direction, otherwise either the anterior or posterior portion of the convexity may be left behind and the operation fail to relieve the obstruction (see diagram, Fig. 157). The blade of the saw soon cuts through the septum, and its central portion enters the opposite nostril, whilst its anterior and posterior portions divide respectively the anterior and posterior limits of the convexity (Fig. 158). The

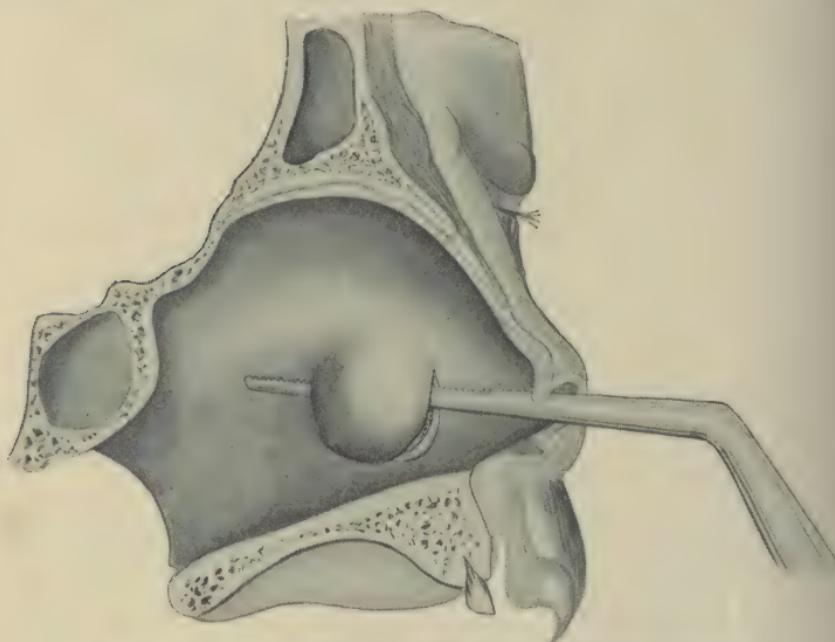


FIG. 158.—U-shaped incision through the cartilage in Gleason's operation.

whole of the deflection except its superior attachment is thus severed by a U-shaped incision. The edges of this incision are necessarily bevelled so that the opening on the concave side is rather smaller than the divided portion of the septum. There is thus produced a large button-hole with bevelled edges covered by a tongue-shaped flap attached to the upper part of the septum as by a hinge. The next step is to put a finger into the obstructed nostril and force the flap through the button-hole. In doing this the convexity is straightened out and the cartilage lengthened so that its lower margin hitches over the lower cut edge of the septum, to which it finally unites (Fig. 159). Moreover, the sides of the flap being rather larger than the hole in the septum,

they will catch on the margins of the opening and their return will be thus hindered. It is, therefore, important to make sure, by careful examination with the finger, that the flap is thrust entirely through the opening, for if any portion of its edges are allowed to remain on the convex side, it is very liable to slip back. In order further to minimise the chances of recurrence of the deformity it is as well to destroy the resiliency of its hinge-like attachment at the upper part of the septum. This may be done by carrying the flap right across to the outer wall of the unobstructed nostril and exercising pressure in an upward direction. Finally, the flap must be retained in position by introducing a nasal tube such as Mouré's (Fig. 163), or a splint such as Lake's (Fig. 160), or better still by packing the nostril with gauze, which is less painful and less irritating. It is better to pack both nostrils for the first forty-eight hours

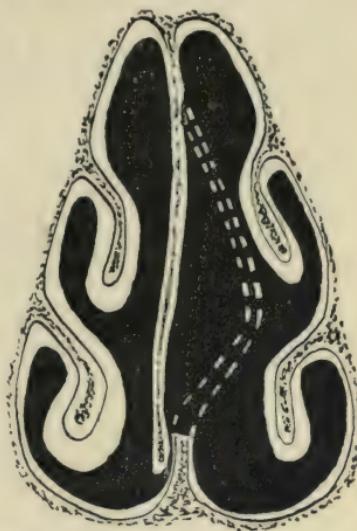


FIG. 159.—Position of the septum on being pushed through the button-hole opening.

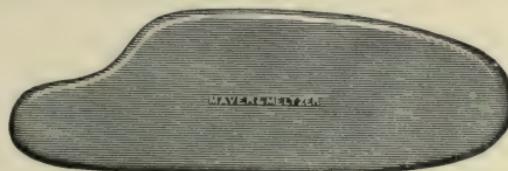


FIG. 160.—Lake's rubber splint.

for fear of pushing the flap too far over and so causing obstruction of the formerly sound nostril.

After-treatment.—At the end of forty-eight hours the packing should be removed and the nostrils cleansed with alkaline lotion. If the septum is in a good position it is generally sufficient to re-pack the affected side only, but if there is any sign of over-correction of the deviation both sides are again packed. The packing is changed and the nasal cavities cleansed daily for about a fortnight. Very careful judgment, however, is required in deciding when to omit the packing, for the success of the operation greatly depends on adjusting the packing in such a way that the septum is kept

straight until union of the wound has taken place. The patient must be cautioned against pulling his nose to one side whilst blowing it or otherwise roughly treating it for six weeks or so after the operation.

Results.—This operation is simple, can be quickly performed, and gives as a rule very good results, if the after-treatment is judiciously carried out. Sometimes the septum is left quite straight, but even if this degree of success is not attained, the nasal obstruction is nearly always relieved.

Moure's Operation.—This consists in making two incisions through the septum, one just above the floor of the nose and one parallel to the bridge; in putting the septum straight, and in retaining it in position by a soft metal tube moulded to the required shape. It is carried out in the following manner:—

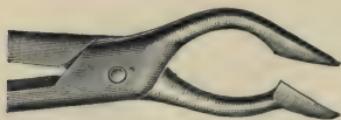


FIG. 161.—Moure's scissors.

A solution of cocaine and supra-renal extract is first applied in the usual way (p. 63), to render the nasal fossæ patent and to control haemorrhage. If local anaesthesia is used alone as recommended by Moure the patient

should be seated on a chair and his head steadied by an assistant; but it is usually better to give a general anaesthetic, in which case the patient is placed in the recumbent position with the head slightly raised and turned towards the operator. The obstructed nostril is illuminated and a pair of specially designed curved scissors (Fig. 161) are introduced, one blade into each nostril, and carried along the floor of the nose below the deviated portion of the septum. The septum is then cut bit by bit just above the floor of the nose for the distance of two or three centimetres. The scissors are then carried upwards without withdrawing them towards the upper part of the septum parallel to the bridge of the nose, and a second incision is made through the cartilage at an acute angle to the first (Fig. 162). The deviated portion of the septum is now movable from side to side, but remains fixed at its anterior and posterior parts. It is, therefore, possible to press it over from the obstructed to the non-obstructed side, which should now be done. A special tube dilator, formed of two parallel blades, of which the outer is fixed and rigid, whilst the inner, or longer one, is soft and malleable, is next introduced on the side of the deviation by means of a specially designed pair of moulding forceps (Fig. 163). When in position the inner or malleable blade of the dilator

is moulded by means of these forceps in such a way that the septum is held in the required position. The dilating tube is left in position for at least eight days.

Moure claims that this method has the advantage of being



FIG. 162.—The dark lines show the incisions for Moure's operation.

extremely rapid, taking scarcely more than a few minutes to perform, and that it is not attended with much haemorrhage, or accidents of any kind; and further that good drainage is maintained without removing the dilator. There is some pain for the first forty-eight hours after the operation, due to swelling of the mucous membrane causing pressure against the dilator, but this may be relieved by keeping the patient at rest and frequently bathing the nose with hot boracic lotion. If suppuration occurs the nasal cavities should be washed out twice daily with warm boracic lotion or the alkaline wash (p. 29).

The results of this operation are generally satisfactory and free nasal respiration is restored. It is not quite so simple as

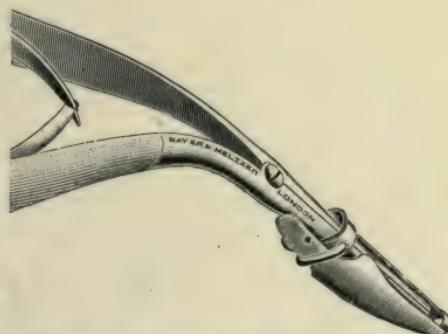


FIG. 163.—Moure's dilator and moulding forceps.

Gleason's operation and entails perhaps a little more suffering to the patient. It is strongly advocated by Pegler.

Asch's Operation.—This consists in making a crucial incision in the centre of the deviation, thus forming four triangular flaps; in then moulding the septum into a better position, and keeping it fixed by the use of splints till healing is complete.

A general anaesthetic is administered, after previously applying solution of cocaine and supra-renal extract on cotton wool tampons. The stenosed cavity is then explored with the little finger to determine where the greatest convexity of the deviation is, and

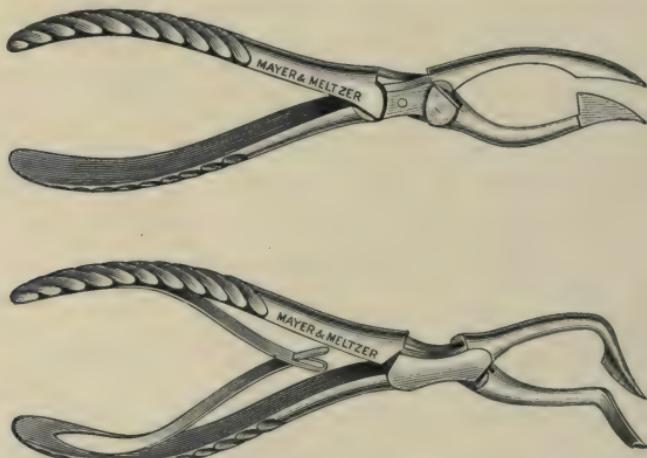


FIG. 164.—Asch's straight and angular scissors.

whether there are any adhesions between it and the outer wall of the nasal cavity. If adhesions are found they must be broken down by means of a curved gouge. The non-cutting blade of Asch's angular scissors (Fig. 164) is now introduced into the obstructed fossa and the cutting or wider blade into the unobstructed side, and an incision is made parallel to the floor of the nose through the greatest convexity of the deviation. The angular scissors are then withdrawn and the straight pair (Fig. 164) are introduced, with which the second incision bisecting the first at right angles is made. As a result of these incisions there are four triangular flaps in the deviated septum all meeting at the point where the transverse and vertical incision bisect each other. The next step is to introduce a finger into the obstructed nostril and push the flaps well over to the other side until they are broken at their bases and their resiliency destroyed. This is very

important, and if it cannot be done with the finger a Smith's septal forceps (Fig. 165) must be introduced, one blade in each nostril, when each flap in turn is seized and broken by twisting it and bending it to and fro. If this step is not adequately carried out, the flaps will spring back into their old position and so spoil the results of the operation. The septum should then be put perfectly straight with the finger introduced into the nostril, or if necessary with Smith's forceps, and when the haemorrhage, which is generally very brisk, has ceased, a hollow vulcanite splint (Fig. 166) of the size and shape suited to the particular case is introduced into the affected nostril and if necessary a smaller one into the patent side to keep the fragments in position.

After-treatment.—The splint in the unobstructed nostril can be removed at the end of twenty-four hours, and not replaced. That in the obstructed side should be retained for forty-eight hours—then removed, thoroughly cleansed, and replaced. This is repeated every day for at least a month, by which time the healing of the septum in its modified position should be complete. After the first few days, the patient may be able to carry this out for himself.



FIG. 166.—Vulcanite splint.

Results.—Asch claims excellent results whatever may be the character of the deviation, whether simple, sigmoid, or vertical, and there is no doubt that he has substantiated his claim, whilst other operators, who have adopted his method, have also found it very successful. It cannot, however, compare in simplicity with Gleason's or even with Moure's operation. It is accompanied by very free haemorrhage which, though nowadays controlled by the use of supra-renal extract, adds a difficulty to the operation; the removal and replacement of the splint is extremely painful for the first week at any rate, and is liable to cause fresh haemorrhage; and the splint by hindering drainage may cause a rise of temperature from septic absorption.

(b) *Simple Deviation in Anatomically Narrow Nares.*—Any of the above operations may fail to restore free nasal respiration



FIG. 165.—Smith's septal forceps.

in unusually narrow nares, because the slightest degree of over-correction will cause obstruction on the formerly patent side, whereas under-correction will leave the affected side as obstructed as before. By far the simplest method of dealing with such a case is to saw off as much of the convexity of the deviation as is necessary to restore the air-way. This will, of course, leave a perforation, and it is therefore thought by some to be a non-surgical procedure. If, however, the functions of both nasal fossæ are restored to activity and the perforation cause the patient no

discomfort, the objections seem to be more of an æsthetic than of a practical character. In practice the result is found to be quite satisfactory in the matter of establishing free nasal respiration, and the perforation does not cause discomfort. A great number of people have perforation as the result of rhinitis sicca, and are quite unaware of the fact. The size of the perforation can often be diminished by straightening the remaining portion of the septum after removing as much as seems necessary.

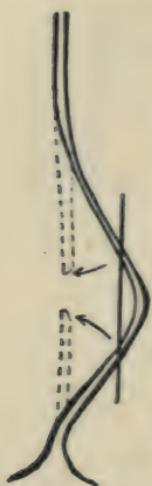


FIG. 167. — Diagram to show the result obtained by removing a portion of the deviation.

The operation is carried out in the following manner:—Cocaine and supra-renal extract are first applied in the usual way (p. 63) to both sides of the septum. After ten minutes the tampons of cotton wool are removed and gas and ether are administered. A nasal saw is then introduced under a good illumination, and about one-third or more of the convexity of the cartilage is sawn through and removed with polypus forceps. The edges of the perforation thus made are broken down and their resiliency destroyed by means of a finger or, if necessary, Smith's forceps. The cartilage is then pushed into the middle line, when the size of the perforation will be greatly diminished and occasionally entirely filled in (Fig. 167). Finally, the septum is retained in this position by carefully packing the affected side, and, if necessary, the unobstructed side, with strips of gauze.

The After-treatment consists in leaving the packing in position for forty-eight hours, and then in changing it daily and cleansing the nose by the use of alkaline lotion. If great importance is attached to reducing the perforation to a minimum and to having as straight a septum as possible, this should be continued for at least a fortnight, great care being exercised to keep the cut edges

in the middle line. If, however, sufficient of the deviation has been removed to restore the air-way, it is a question whether it is worth while to subject the patient to the discomfort entailed by the daily packing.

Results.—Union of the cut edges of the septum may very occasionally be obtained, leaving the patient with practically a normal septum, but generally a permanent perforation is caused. This, however, as already pointed out, in no way interferes with the comfort of the patient, or with the good results of the operation. Occasionally there may be at first a whistling noise on blowing the nose or taking a deep inspiration, but the patient soon learns to avoid this inconvenience.

C. Deviations with Spurs or Thickening of the Septum.—Deviations are very commonly associated with more or less thickening of the cartilage over its greatest convexity, or the convexity may be supported by a spur-like thickening below it.

The exact operation for the correction of these deformities must vary according as the spur or the deviation is the greater cause of the obstruction, and as the nasal cavities are roomy or unusually narrow.

If the *nose is roomy* and the spur is more responsible for the stenosis than the deviation, the former should be sawn off in the manner recommended above for spurs without deviation. If, when the resulting wound is entirely healed, the deviation is found to be causing respiratory difficulties the case must be treated as one of simple deviation, and Gleason's, Moure's, or Asch's operation performed.

If the deviation is in excess of the thickening or spur, one of two courses may be followed. Gleason's operation may be performed, and then, after the septal cartilage has become firmly healed in its new position, that is, in two or three months' time, the spur may be removed if any nasal obstruction still persists. The alternative course is to remove the spur or thickening, and at once to proceed with Moure's operation.

If the *nose is narrow* the simplest operation is on the lines of that described above for simple deviation under similar circumstances. The thickened part of the septum, together with the apex of the deviated portion of the cartilage, should be sawn off making a perforation. The edges of the perforation should then be loosened by manipulation and brought into the middle line, and the nose packed with gauze to retain them in position (Fig. 167).

It is, however, in these cases that one of the resection operations more recently introduced is especially indicated, though, unfortunately, they are particularly difficult to carry out with success.

Resection Operations.—There are two chief methods of resecting the obstructing portion of the septum. In the first, the mucous membrane on both sides of the septum is preserved (Killian's method), and in the second, the mucous membrane on



FIG. 168.—Smurthwaite's elevator.

the concave side only is left (Krieg-Bönninghaus). The latter is the simpler and on the whole gives equally good results, but in the former healing is more rapid.

Killian's Method.—The first question to decide is whether local anaesthesia alone should be used, or whether it should be followed by a general anaesthetic. If the deformity is situated anteriorly and is purely cartilaginous, local anaesthesia is generally sufficient except in highly nervous people; if the deviation is far back and involves the bony septum, general anaesthesia is advisable. Smurthwaite and Freer, however, who are strong advocates of Killian's operation, consider that local anaesthesia is always sufficient and much to be preferred. Smurthwaite advises the following method of inducing it:—A pledget of cotton wool, soaked in a 5 per cent. solution of cocaine and supra-renal extract, is inserted



FIG. 169.—Freer's nasal knife.

into the obstructed nostril and there left for two minutes. When withdrawn one drachm of a 2 per cent. solution of β -eucaine is injected beneath the mucous membrane of the septum, the point of the needle entering half an inch from the anterior end of the cartilage. Finally the nasal fossa is packed with wool soaked in a 5 per cent. solution of supra-renal extract. Full anaesthesia and contraction of the vessels is obtained in fifteen minutes. Freer first applies adrenalin and then rubs in powdered cocaine over the area of operation, and claims that he gets a more profound anaesthesia in a shorter time. When anaesthesia has been induced,

the patient is placed on an operating table with the head raised, and the nasal cavity is well illuminated either by reflected light or by means of Kirstein's electric head lamp. A vertical incision about three-quarters of an inch long is made through the mucous membrane down to the cartilage about half an inch in front of the deflection. The mucous membrane and the perichondrium are then separated from the cartilage by means of



FIG. 170.—Killian's knife for dividing the cartilage.

special elevators (Fig. 168) to the farthest extent of the deviation. A horizontal incision is next made through the muco-perichondrium along the whole length of the lower border of the deviation with a special knife (Fig. 169) and the loosened muco-periosteum is turned upwards and backwards and held out of the way with a pledget of cotton wool. The cartilage is then divided by an incision following the line of the vertical incision through the mucous membrane, and the muco-perichondrium separated from the concavity of the deviation. This must be done

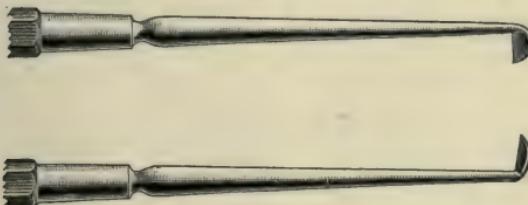


FIG. 171.—Freer's knives for dividing the septum.

very carefully and deliberately, for bruising or tearing of the membrane is likely to cause sloughing, and thus to interfere with the success of the operation. Having lifted the mucous membrane from both sides, the cartilage is divided along the upper and lower borders of the deviation by means of Killian's forked knife (Fig. 170). The posterior border may be divided from the concave side with Freer's angular knife (Fig. 171), or with Smurthwaite's modification of Killian's knife, and then the cartilage can be removed with polypus forceps. In very narrow nasal cavities there may be

considerable difficulties in making this posterior incision, in which case the deviated cartilage should be gradually punched away with cutting forceps (Fig. 172), working from before backwards and making sure that the whole deflection is removed. If the deflection extends back to the bony septum the cartilage may be simply torn from its attachment with polypus forceps and removed. Finally the mucous membrane on the convex side is allowed to fall back into position, and retained there by the insertion of one or two stitches uniting the anterior vertical incision. These stitches are not always necessary. Freer recommends that the

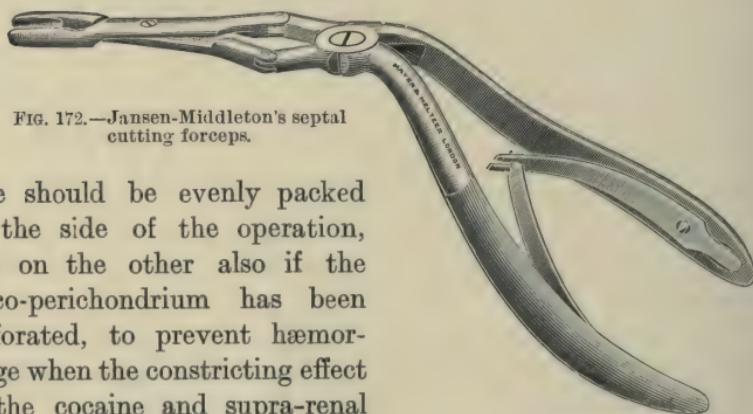


FIG. 172.—Jansen-Middleton's septal cutting forceps.

nose should be evenly packed on the side of the operation, and on the other also if the muco-perichondrium has been perforated, to prevent haemorrhage when the constricting effect of the cocaine and supra-renal extract has passed off.

If a general anaesthetic is given the nasal cavity should be previously packed for fifteen minutes with swabs of wool soaked in the solution of cocaine and supra-renal extract (p. 64), and the operation must be performed with the patient in the recumbent position.

Though it is nearly always easier to operate from the obstructed side, in some instances it may be found better to work from the concave side of the deviation.

After-treatment.—The packing, if any has been used, should be removed very gently after the first twenty-four hours and not replaced, but the nostril should be closed with a pledget of cotton wool, so as to give functional rest to the wounded nasal cavity and prevent the entrance of dirt and other impurities. This may be discontinued after four or five days, and then the nostril must be kept clean by the use of the alkaline nasal wash, whilst the formation of crusts should be prevented by the frequent use of some oily preparation, such as menthol in paroleine (6 grs. to the

ounce) applied with a nebuliser. After three or four weeks all treatment can be abandoned.

Results, Advantages, and Disadvantages.—When each step of this operation can be carried out exactly as it should be without accident of any sort, the results are absolutely satisfactory. There is complete relief of the nasal obstruction; no tedious after-treatment with splints or packing is necessary; and there is little tendency to the formation of crusts. In many instances it is, however, an extremely difficult operation, requiring much skill, time, and patience; and often, however great the skill, it is impossible to avoid cutting or severely bruising the mucous membrane, especially that on the concave side. If this happens, sloughing may occur and a permanent perforation result, often much greater in extent than that deliberately planned in the operation described above (p. 337). A further disadvantage of the operation is the length of time which it takes. In spite of the application of supra-renal extract the haemorrhage is often profuse enough to obscure the view, thus necessitating constant sponging which renders progress extremely slow. The operation consequently takes, according to the dexterity of the operator, from thirty minutes to one hour and even longer, and it is a question whether the results are so markedly superior to those obtained by simpler methods as to justify this. There are considerable risks under general anaesthesia, for even in the most skilful hands anaesthetics are especially dangerous in operations on the upper respiratory tract. Under local anaesthesia there is often a considerable amount of nervous shock, from which it takes the patient several days to recover. Finally, when healing is complete some patients complain of considerable irritation in the nose, which is due to "flapping" of the membranous septum in the air-stream.

Krieg-Böninghaus's Operation, or Fenster-Resection.—In this operation, which is strongly advocated by Tod, the mucous membrane on the concave side is alone preserved, that on the convex side being cut away with the thickened and deviated septum, which renders the operation easier and quicker than Killian's. It can, therefore, more often be performed under local anaesthesia alone, especially when the cartilage only is affected. Having applied cocaine and supra-renal extract and, when necessary, having given a general anaesthetic, a vertical incision three-quarters of an inch in length is made through the mucous membrane and cartilage on the obstructed side of the nose, just in front of

the convexity of the septum, care being taken not to injure the mucous membrane on the concave side. An elevator is passed through this incision and the mucous membrane raised from the concavity. The whole of the deviated portion of the cartilage is then cut away with cutting forceps (Fig. 172, p. 342) together with the mucous membrane covering the convexity.

The *After-treatment* consists in cleansing the nasal cavity with alkaline lotion and preventing the formation of crusts on the raw surface by the use of either the menthol or nitrate of mercury spray (p. 50). For the first few days the nostril should be closed with a pledge of cotton wool.

Results, Advantages, and Disadvantages.—Very good results are generally obtained. Compared with Killian's it is easier and more quickly performed, and the after-treatment is equally simple. There is a tendency to the formation of crusts for a few weeks, but this does not, as a rule, cause any great trouble. If the mucous membrane is bruised or torn whilst being separated from the concavity, sloughing with resulting perforation will occur. Compared with cutting off the thickened portion of the septum together with the apex of the convexity of the deviation, it is more difficult and takes longer, but in a successful case a perforation is avoided.

D. Dislocation of the Anterior End of the Triangular Cartilage.—

This, if at all marked, causes considerable nasal stenosis, and the obstructing portion should be removed by operation. Local anaesthesia having been induced in the usual way (p. 63), the tip of the nose is raised with a finger so as to expose the deformity, and a vertical incision is made over the most prominent part of the projecting cartilage with a fine sharp-pointed knife; the mucous membrane and the perichondrium are turned off the cartilage with a blunt dissector, and the projecting cartilage itself cut off with a blunt-pointed knife, or a pair of scissors. The edges of the incised mucous membrane are brought together with one suture and then painted with collodion. No after-treatment is required. The wound usually heals firmly in the course of four or five days when the stitch can be removed. Dislocation of the columnar cartilage, as described by Bosworth, must be dealt with in exactly the same manner.

Summary.—Simple spurs should be removed; simple deviations in a *roomy* nose should be corrected by Gleason's, Moure's, Asch's, or Killian's operation, and in a *narrow* nose by removal of the apex of the convexity or by Killian's resection. In

deviations with spurs or thickening of the septum in a *roomy* nose, the thickened part should be sawn off, and if this is not sufficient, Gleason's, Moure's, or Asch's operation should be afterwards performed ; and for similar conditions in a narrow nose, the thickening together with the apex of the convexity should be removed and the cut edges straightened, or one of the resection operations should be performed. When there is dislocation of the anterior end of the septal cartilage, the obstructing portion should be removed by submucous resection.

Other Methods.—Spurs may also be removed with burrs or trephines or with cutting instrument other than those already mentioned, and deviations may be corrected by other incisions than those recommended by Moure and Asch, but the principles involved being the same, the methods need not be described. A few methods differing in principle may be just mentioned.

Walsham's Operation.—This consists in forcibly fracturing and straightening the septum by means of flat-bladed forceps (Fig. 165, p. 337) *without* previous division of the septum, and in retaining it in position by the use of plugs. The objections to this method are, firstly, that great force is required to break up the septum, and that it is therefore followed by much bruising, swelling, and severe pain, rendering the retention of the plugs extremely difficult ; and, secondly, that to secure a straight septum the fractured fragments must overlap each other. This is much more easily secured by first dividing the septum in definite directions and then pushing the cartilage into position.

Forcible Dilatation by means of Hill's dilator made on the principle of a glove-stretcher. This is a very painful method, and the results are neither satisfactory nor permanent. It is especially recommended for correction of deformity of the bony septum.

Electrolysis.—This was at one time strongly recommended by Moure and gained great support from other operators, but it is difficult to regulate the exact amount of destruction. Moure himself has given it up in favour of his operation above described.

Electric Cautery.—This, though at one time extensively used for the destruction of spurs and thickenings, has been given up. It is a very slow method, requiring many sittings, and causing the patient considerable worry and pain from inflammatory reaction.

II. HÆMATOMA AND ABSCESS OF THE SEPTUM

These conditions may be considered together, as the latter is almost always a sequel of the former.

Etiology.—Hæmatomata are very much more common in children than in adults, and are caused by falls or blows on the nose. Abscesses are due to pyogenic organisms gaining entrance through abrasions of the mucous membrane, and infecting the blood

tumour. They may very rarely occur independently of hæmatomata, in which case they are generally secondary to typhoid fever (Mackenzie), syphilis, tubercle, smallpox, or erysipelas. In rare instances a septal abscess may be caused by suppuration spreading from one of the upper incisor teeth.

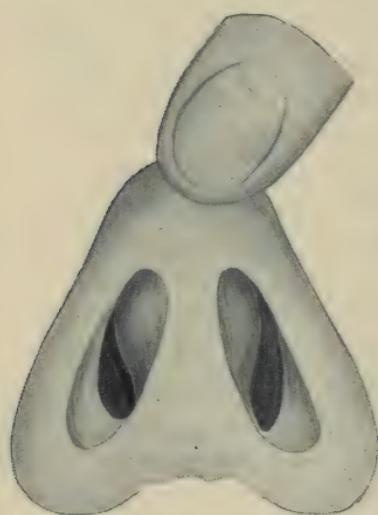


FIG. 173.—Abscess of the septum nasi.

Pathological Changes.—In hæmatomata there are generally signs of violence on the outside of the nose, such as swelling or bruising, and within the nose there is a red rounded swelling on each side of the septal cartilage, soft and fluctuating at first, but afterwards firmer. If an abscess

form, the swelling becomes very tender and pits on pressure with a probe, whilst heat, swelling, and redness of the external parts of the nose can generally be observed. Symmetrical swellings, red in colour, can be seen on the septum just within the vestibule (Fig. 173).

The Symptoms of hæmatoma are a little pain and stiffness within and about the tip of the nose, with more or less nasal obstruction. If an abscess occur, the pain increases and becomes of a throbbing character, the parts become very tender, and there may be a slight rise of temperature with a feeling of malaise. If the abscess burst, there will be a discharge of blood and pus from the nose. Occasionally the abscess becomes chronic in character, and causes very few symptoms except some nasal obstruction.

Sequelæ.—Following an abscess, necrosis of the cartilage may occur as a result of injury to the perichondrium or of its separation

from both sides of the septum. This is generally followed by a permanent perforation of the septum. As a later result external deformities, such as depression of the tip of the nose, or sinking in of the bridge, may occur, due either to the formation and contraction of cicatricial tissue or to arrest of development.

The Diagnosis of haematoma is generally quite easy, especially when there is a clear history of injury. An abscess may have to be differentiated from a breaking-down gumma. The abscess is always symmetrical, is soft and fluctuating on pressure with a probe, and is situated in the anterior portion of the septal cartilage. A gumma on the other hand is met with in adults, is unilateral, is far less inflamed and painful, and it usually ulcerates rapidly, generally attacking the bony septum.

Treatment.—A haematoma should be left alone and its absorption encouraged by the application of cold evaporating lotions to the nose. If an abscess forms, free incisions should be made as early as possible. Gas should generally be administered, though in exceptionally quiet children local anaesthesia is sufficient. A free incision is then made into the abscess on both sides of the septum so as to secure efficient drainage. For the first few days after the operation, a probe should be passed into the incisions to keep them open, and to make sure that there is no re-accumulation of pus. When all discharge has ceased, the incisions should be allowed to close.

Result.—As a general rule this will be followed by complete healing, but if operation has been long delayed, necrosis of the cartilage may occur and a perforation result. The longer the abscess has been left untreated the greater are the chances of external deformities, especially if the original injury was of a severe character.

III. PERFORATION OF THE SEPTUM

A perforation of the septum is not a disease in itself, but only a result of some morbid process, and though it requires no special treatment, it may be useful in this place to enumerate its causes. It may be said briefly that the commonest cause of perforation of the cartilaginous septum is the atrophic or perforating ulcer occurring in rhinitis sicca; whilst syphilis is most commonly responsible for perforations of the bony septum. In addition to these causes, however, perforations may result from tubercle, including lupus,

injuries, surgical operations, traumatic rhinitis, abscesses, diphtheria, typhoid fever, or gangrene from any cause. Very rarely indeed it may occur as a congenital defect.

The chief points of diagnostic value have already been mentioned under chronic dry rhinitis (p. 299).

IV. ADHESIONS BETWEEN THE SEPTUM AND OUTER WALL OF THE NOSE

Etiology.—Any disease or injury which causes simultaneous injury to the septum and outer wall of the nose may lead to adhesions. They may therefore result from syphilis or tubercle, from diphtheria or fibrinous rhinitis, from the presence of a foreign body, or from injuries due to external violence or intra-nasal operative treatment.

Pathological Changes.—Adhesions are commonest between the inferior turbinal and the septum, although they may occur between the middle turbinal and septum, or between the two turbinals. They may be long narrow bands or short broad webs. A web-like adhesion may also occur at the junction of the skin of the vestibule with the true mucous membrane of the nasal cavities, and may greatly diminish the size of the nostrils. These are sometimes of congenital origin, and sometimes due to syphilis or trauma.

Symptoms.—When the adhesion takes the form of a long

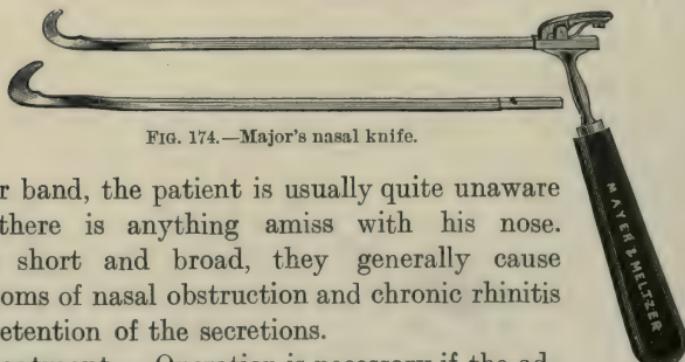


FIG. 174.—Major's nasal knife.

slender band, the patient is usually quite unaware that there is anything amiss with his nose. When short and broad, they generally cause symptoms of nasal obstruction and chronic rhinitis with retention of the secretions.

Treatment.—Operation is necessary if the adhesion causes symptoms, if it prevents a satisfactory examination of the nasal cavity, if it hinders the passage of a Eustachian catheter, or if it interferes with the performance of necessary intra-nasal operations. Long slender bands should be divided under local anaesthesia from behind forwards with a hook-shaped

knife (Fig. 174), and the resulting tags snipped off with Grünwald's forceps, or they may be destroyed by means of the cautery. The worst cases of adhesions generally occur in conjunction with spurs or deviations of the septum, and, in order to get a good permanent result, it is necessary to give the patient a general anæsthetic and to remove the spur or correct the deviation. Spurs should be first severed from the septum (p. 328), and then divided from the inferior turbinal with scissors or a spokeshave. If the inferior turbinal is enlarged, a portion of it should at the same time be removed (p. 269). If deviations exist, the adhesions must be first divided and the deviation then corrected by one of the methods already described.

The *After-treatment* of simple division consists in keeping the nose clean with alkaline lotion, and in preventing re-adhesion of the wounded surfaces by the passage of a probe every forty-eight hours or so. If a spur has been removed or a deviation corrected, the after-treatment will vary according to the particular operation performed. The methods of preventing adhesions mentioned on p. 71 must be carefully carried out in these as in all intra-nasal operations.

V. COLLAPSE OF THE ALÆ NASI

Collapse of the alæ nasi is often a source of nasal obstruction and consequent pharyngeal and laryngeal troubles. Unless the condition is recognised and treated much disappointment may result after the removal of adenoids for the relief of intra-nasal obstruction, owing to continued difficulty in breathing through the nose. The patient will sometimes complain that the obstruction is worse when lying down at night, the uppermost side becoming almost completely blocked. This is probably due to the ala falling against the septum. In chronic rhinitis the side on which the patient lies is more obstructed (p. 216). The collapse may be due to a faulty formation of the lateral cartilages of congenital origin (Fig. 175), but more often it is the result of nasal obstruction during childhood. The consequent disuse of the dilators allows collapse of the alæ, and the lumen of the nostrils may be further narrowed by over action of the constrictors.

Treatment.—Many cases may be relieved by developing the dilators of the alæ nasi by systematic exercise, and this is undoubtedly the best method whenever the patient can be taught to

carry it out, but sometimes from long disuse or from stupidity it seems impossible to get the muscles to respond to the patient's volition. The patient should first be shown the action of the muscles, and must then practise the movement in front of a glass until the muscles are well under control. He should then systematically use them for about three minutes four times a day,



FIG. 175.—Deformity of the alæ nasi.



FIG. 176.—From the same patient as Fig. 175, with Francis' supports supplied.



FIG. 177.—Francis' nasal props.

whilst exercising slight resistance to their action by gently grasping the alæ between the finger and thumb. If this is persisted in long enough great improvement usually results.

The other methods recommended are (1) gradual dilatation, (2) forcible or rapid dilatation of the nostrils, and (3) operative measures.

Gradual Dilatation is carried out by inserting perforated silver or rubber tubes within the nostrils, and making the patient wear them about fourteen hours out of the twenty-four. The size of the tubes should be gradually increased and so regulated as to exercise slight pressure on the alæ nasi. The tubes should be carefully

cleansed when removed from the nose. This method will generally give the patient relief from the symptoms of nasal obstruction, and is especially appreciated at night when most discomfort is experienced, but it cannot be looked upon as permanently curative. Directly the tubes are left off, recurrence will take place unless the dilators of the alæ nasi have simultaneously been developed. The tubes sometimes set up so much irritation that they cannot be tolerated. Recently Francis has introduced some silver wire supports which can be worn with perfect comfort and great relief to the obstruction, and they may be strongly recommended (Figs. 176, 177).

Rapid and Forceful Dilatation has been recommended by Scanes Spicer. The patient is anaesthetised and the alæ are wrenched open by dilators of the glove-stretcher type. Short india-rubber tubes are then worn for a short time to maintain the improvement. It is difficult to see how this method can give anything but a very temporary benefit.

Walsham's Operation.—Walsham recommended forming an artificial support to the alæ by raising a strip of mucous membrane from each side of the septum, rolling it up to the top of the septum and allowing it to heal in that position.

Injections of paraffin have also been tried, but without much success. The wax is injected into the alæ and the nostrils are held widely open whilst it is hardening.

CHAPTER XIII

NASAL NEUROSES

- I. SENSORY NEUROSES: A. Of *Olfactory Nerves*.—B. Of *Sensory Nerves*.
- II. REFLEX NEUROSES: A. *Nasal Reflexes*—Hay Fever, Paroxysmal Rhinorrhœa and Allied Affections—Hydrorrhœa.—B. *Referred Reflexes*—Asthma, its Nature and Treatment.

IN this chapter the following morbid conditions will be considered :—

- I. Sensory Neuroses.
 - A. Of the olfactory nerve.
 - B. Of the sensory nerve.
- II. Reflex Neuroses.
 - A. Nasal reflexes.
 - B. Referred reflexes.

I. SENSORY NEUROSES

A. NEUROSES OF OLFACTORY NERVE

The special nerve endings of the olfactory nerve are limited to a small area in the fourth meatus, extending half-way down the superior turbinal and to a corresponding extent on the septum (A. von Brunn). The morbid conditions met with in connection with this nerve are anosmia, hyperosmia, and parosmia.

Anosmia.—*Definition*.—Partial or complete loss of the sense of smell, often accompanied by interference with the sense of taste.

Etiology.—Anosmia may be due to (1) nasal obstruction, (2) changes in the mucous membrane of the olfactory region, and (3) lesions of the nerve itself. Nasal obstruction causes anosmia by preventing the aroma-laden air from reaching the nerve endings. Nasal polypi and enlargement of the middle turbinals are the most frequent source of this form of anosmia, though it may be due to hyperplasia, spurs, deviations, tumours, or crusts. Changes in the mucous membrane causing anosmia may occur in connection with acute rhinitis of any origin, with atrophic rhinitis, or with nasal syphilis or tubercle. Lesions of the olfactory nerve may be central or peripheral. Central lesions are generally due to cerebral

tumour; peripheral lesions to specific fevers, especially influenza, or to the over stimulation of the nerve endings, as by the inhalation of the fumes of strong ammonia. Anosmia may also follow fractures of the base of the skull.

Prognosis.—The prognosis is most favourable when the anosmia is due to nasal obstruction. In recent cases recovery usually takes place on removal of the cause, and it occasionally does so after many years' duration. When due to lesions of the nerve itself or to changes in the mucous membrane, the chances of recovery are not very good, even in early cases.

Treatment.—When anosmia is due to obstruction, the cause must be removed without delay, for the longer the disability lasts the less curable it becomes. After removing the obstruction Mackenzie recommends stimulating the nerve endings by the local application of a weak solution of strychnine or a powder containing $\frac{1}{4}$ of a grain of strychnine to two grains of starch. It is also recommended that the sense of smell should be re-educated by sniffing fairly strong odours up the nostrils. Ordinary snuff and stimulating lotions (p. 48) are also said to do good. In cases where no obstruction exists less can be done. The local treatment should be that recommended above, and strychnine should be given internally. Iodide of potassium is sometimes useful, especially when the anosmia is the result of syphilis.

Hyperosmia.—This denotes a condition in which the olfactory nerves respond in an exaggerated degree to ordinary stimuli. It is purely a subjective phenomenon, and occurs chiefly in connection with hysteria, especially that directly depending on derangements of the uterine organs. Sometimes during the menstrual period or during pregnancy patients become so sensitive to smells of all kinds that they undergo real suffering. There is no satisfactory method of treatment, beyond that of the general condition on which it depends.

Parosmia.—This means a perversion of the sense of smell. One thing may smell to the individual like something else, or the patient may suffer from a purely imaginary smell, generally of a very disagreeable nature (cacosmia). This latter condition is not uncommon as an hallucination in the insane, and may be a symptom of a tumour or functional derangement of the temporo-sphenoidal lobe. A subjective disagreeable smell is often complained of in cases of suppuration of the maxillary antrum (p. 263) or other sinus, in syphilitic necrosis, and occasionally when a foreign body

is present in the nasal cavities. It is important that such causes of cacosmia should not be overlooked.

B. NEUROSES OF THE SENSORY NERVES

Common sensation is supplied to the nasal mucous membrane by the superior maxillary division of the fifth nerve, except just in front where it receives its supply from the nasal branch of the ophthalmic division. Anaesthesia, hyperaesthesia, and paraesthesia may be met with. Anaesthesia and paraesthesia are very rare. The former may occur in cases of cerebral tumour or haemorrhage, and the latter is an accompaniment of hysteria. Hyperaesthesia occurs in individuals of a neurotic type, and is much more common. It is intimately associated with local lesions and the reflex neuroses about to be described.

II. REFLEX NEUROSES

The whole question of nasal reflex neuroses is still much under discussion. There are some who maintain that almost any distant trouble *can* be caused by reflex action, the original irritation being due to some abnormality within the nose ; whilst there are others who maintain that only exaggerated forms of the normal physiological reflexes of nasal irritation, such as sneezing, rhinorrhœa, lachrymation, and coughing can occur.

The following is a classification of the various reflex abnormalities which have from time to time been attributed to intra-nasal disease. They may be divided into nasal reflexes, or cases in which the symptoms are an exaggeration of the physiological reflexes ; and into referred reflexes, or cases in which the symptoms are referred to distant parts of the body.

A. NASAL REFLEXES

1. Hay fever.
2. Paroxysmal sneezing and rhinorrhœa.
3. Vaso-motor turgescence of the mucous membrane.
4. Hydrorrhœa.
5. Lachrymation.
6. Cough.

B. REFERRED REFLEXES

1. Asthma.
2. Migraine and epilepsy.
3. Nightmare and enuresis.
4. Aprosexia and malnutrition.
5. Exophthalmic goitre, palpitation, and other cardiac neuroses.
6. Dyspncea, spasm and paresis of the larynx.
7. Spasm of the oesophagus and vomiting.
8. Neuralgia and headaches.
9. Vertigo, chorea, and stammering.
10. Conjunctivitis, glaucoma, keratitis, and blepharospasm.
11. Dysmenorrhœa.

There is no particular difficulty connected with the first group, as it is not unreasonable to suppose that in certain individuals an exaggeration of the normal nasal reflexes may be due to any form of persistent nasal irritation. It is much more difficult to explain the various referred reflexes. Many of them are probably the direct result of the intra-nasal changes and are not reflexes at all, whilst the others are extremely rare in connection with nasal disease. Asthma is occasionally associated with intra-nasal disease, and is relieved by nasal treatment: it is therefore probable that persistent nasal irritation may be the exciting cause of asthmatic attacks in people predisposed to them.

The conditions which may at all events in many instances be considered as direct results of nasal disease are vomiting, due to swallowing muco-purulent discharge; conjunctivitis, keratitis, and other eye affections, due to direct extension of inflammatory processes; malnutrition, aprosexia, nightmares and epileptiform convulsions, due to persistence of nasal breathing during sleep in spite of nasal obstruction (p. 390); paroxysmal neuralgia and headaches due to retention of pus in an accessory cavity (p. 263), or to pressure of the middle turbinals against the septum (p. 229).

As regards the rarer referred reflexes it would be absurd to maintain that they are at all frequently due to nasal trouble, but bearing in mind how entirely the central nervous system can be deranged, especially in children, by any strong and persistent local irritation, it is not at all improbable that occasionally one or other of them may occur as a result of a local irritation in the nose, and may be relieved by nasal treatment. Teething in ill-

nourished children will undoubtedly cause mal-assimilation of food, diarrhoea, bronchitis, fits, and a condition simulating meningitis, all of which can often be relieved by the simple operation of lancing the gums. Worms may also cause similar conditions. Before coming to the conclusion, however, that any reflex symptom is of intra-nasal origin, the case must be considered from all points of view and other causes carefully excluded. If after due consideration the nasal trouble seems the most likely cause, the nose should be treated, though no definite promise of success can be given.

Though the whole question of nasal reflexes is full of interest, only hay fever, paroxysmal rhinorrhœa, vaso-motor turgescence of the mucous membrane, hydrorrhœa and asthma require to be dealt with in detail.

Hay Fever: Paroxysmal Rhinorrhœa: Vaso-motor Turgescence of the Mucous Membrane

These conditions are closely allied, and vary only in degree and in the nature of the exciting cause.

Definition.—A sudden tumefaction of the intra-nasal mucosa due to vaso-motor dilatation of the vessels causing in all three forms turgescence of the mucous membrane, and, in hay fever and paroxysmal rhinorrhœa, attacks of violent sneezing, a profuse watery discharge from the nose, lachrymation and sometimes asthma.

Etiology.—Three important factors enter into the causation of these conditions, namely, (1) a predisposing idiosyncrasy, (2) a peculiar condition of the nasal mucous membrane, and (3) some local irritant.

(1) The *Peculiar Idiosyncrasy* is most probably some form of neurosis. The patients are nearly always of the neurotic temperament, and in some cases it is possible to get a history of similar nasal conditions in previous generations, whilst in others a history of some neurotic strain can generally be found.

(2) Of the *Peculiar Condition* of the *Nasal Mucous Membrane* nothing very definite can be said, except that often there is hyperæsthesia. In some cases the application even of cocaine acts as an irritant, causing increased swelling and secretion instead of collapse of the mucous membrane. Occasionally some gross lesion may be found within the nose, such as hyperplasia of the

turbinals, a spur or deviation of the septum, or polypi, any of which conditions may act as predisposing causes, and will always greatly add to the discomfort of the attack.

(3) *The Local Irritant*.—In hay fever the commonest exciting cause is the pollen of certain grasses and flowers. In certain individuals, however, an attack of hay fever may be induced by very many other local irritants. As examples may be mentioned the smell of roses, peas, maize, or lentils; the exhalations from cats, rabbits, and guinea-pigs; and the dust of beds and wood pavement. In America the pollen from the Roman wormwood is the most frequent cause. In paroxysmal rhinorrhœa sudden changes of temperature are more often the exciting cause, and the attack most frequently commences directly the patient gets out of bed in the morning, though exposure and draughts may induce an attack any time during the day. Vaso-motor turgescence is usually induced by hot dry air, especially that met with in ill-ventilated rooms or public meeting halls.

Of these three main etiological factors, the existence of two are probably sufficient in many patients to induce one or other of the morbid conditions under consideration, though most usually all three are present. For instance, in some sufferers from hay fever it is possible to exclude the neurotic temperament, whilst in others the neurosis is evident, but the hyperæsthetic condition of the mucous membrane is absent. In others again, though very rarely, the local irritant is absent, as when an attack is induced by the sight of artificial roses.

Pathological Changes.—The chief changes during an attack are redness and swelling of the nasal mucous membrane. The inferior turbinals are generally so engorged that they fill the nasal cavities, and prevent inspection of the deeper parts. This is accompanied by a profuse watery discharge. Between the attacks the mucous membrane is seen to be somewhat pale, oedematous, boggy and swollen. In hay fever this entirely clears up after the hay season is over, and the nose may present nothing whatever abnormal until the following season. In paroxysmal rhinorrhœa, which commonly persists more or less the whole year, but is especially marked in the winter months, the mucous membrane often remains swollen and oedematous. The inferior turbinals look juicy, the anterior ends of the middle turbinals are often polypoid, and very frequently there is an oedematous swelling on the septum in the region of the tubercle. In simple vaso-motor turgescence

there is generally nothing wrong to be seen between the attacks, except perhaps a depression on the septum, where the inferior turbinal presses during an attack. It must be remembered, however, that these vaso-motor changes are very much more common in subjects of chronic rhinitis (p. 213), and the pathological changes due to this latter condition may be present. In all three forms other intra-nasal lesions may be present, such as spurs, deviations, polypi, or hyperplastic swellings. These may cause or aggravate the symptoms, but are not part of the pathological process.

The Symptoms of hay fever and rhinorrhœa are those of the first and second stages of an ordinary acute catarrhal rhinitis (p. 191), only more sudden in their onset and more severe in character. In hay fever the attack lasts from a few hours to a few days, and ceases often as suddenly as it began. It recurs at varying intervals during the hay-time. In paroxysmal rhinorrhœa the attack lasts from half-an-hour to many hours, recurs every morning or evening, and occasionally morning and evening. The attacks may persist with perhaps short intervals of rest all the year round, but are usually most marked in cold and damp weather. Occasionally these neuroses lead to great exhaustion, loss of flesh and depression, entirely incapacitating the patient. Vaso-motor turgescence may occur at any time of the year, but is more common in winter when chronic rhinitis is prevalent. It causes intermittent nasal obstruction without rhinorrhœa, but, on the contrary, with uncomfortable dryness. Asthma is frequently associated with all these vaso-motor disturbances. In hay fever it usually commences soon after the onset of the nasal symptoms, though occasionally it is postponed until night time. Sometimes the asthma more or less replaces the hay fever, the symptoms of the latter being merely stuffiness and uneasiness of the nose. Some people remain wheezy and short-winded between the asthmatic attacks all the hay season, though as a rule the attack ceases suddenly and completely after an hour or two's suffering. In paroxysmal rhinorrhœa the asthmatic attack more often takes place during the night, and may be the most prominent symptom, the history of the rhinorrhœa being elicited only by questioning. Finally, an attack of asthma is often preceded by stuffiness of the nose due to vaso-motor turgescence.

Diagnosis.—The symptoms and history are so characteristic that errors in diagnosis are hardly likely to occur.

Prognosis.—The liability to hay fever becomes less, and perhaps

ceases altogether, as the age of the patient advances beyond forty-five. This is also true, but to a more limited extent, of paroxysmal rhinorrhœa. Both conditions can generally be kept under control by general and local treatment, and sometimes cured. The prognosis of vaso-motor turgescence is always good.

Treatment.—The treatment of vaso-motor turgescence must be carried out on the same lines as that recommended for chronic rhinitis with tumefaction of the inferior turbinals (p. 217), modified to a certain extent according as the patient is or is not markedly neurotic. In any case attention to the general health, and especially to the digestive tract, is important. In women any irregularities of the menstrual functions must be attended to.

The treatment of hay fever and paroxysmal sneezing is important, and may be discussed under the prophylactic, the general, and the local treatment.

1. Prophylactic Treatment.—In genuine hay fever the ideal method of prevention is to remove the patient from the source of irritation during the hay season, that is, from about the last week in May to the end of the first or second week in July, or in bad cases even longer. A sea voyage will most completely effect this; but when this is impossible, residence at the seaside is advisable, and often quite efficacious. If the patient is unable to leave home, something may be done towards preventing attacks by wearing cotton-wool in the nostrils and blue goggles over the eyes whilst out of doors. Many cases of paroxysmal rhinorrhœa are in the first instance a sequel of acute rhinitis, and therefore the preventive treatment of the latter (p. 196) and the careful treatment of its third stage (p. 195) are prophylactic measures against the rhinorrhœa, and are especially important in neurotic individuals. In both hay fever and paroxysmal rhinorrhœa the correction of intra-nasal abnormalities, which will be described under local surgical treatment, is an important prophylactic measure.

2. General Treatment.—Seeing that the underlying predisposing cause of all these conditions is so often a neurosis, general treatment is very important both during and between the attacks. Many drugs have found favour, amongst which may be mentioned quinine, strychnine, opium, belladonna, valerian, and arsenic. The two last are those on which most reliance can be placed. Before commencing any of them, however, it is important to make sure that the digestion is good, and that the bowels are acting regularly. When this has been done, the *Mistura Arsenici Alkalina* (p. 60)

should be given three times a day after food, or if the patient is anaemic, arsenic may be combined with iron (see formula, p. 110).

As an alternative to arsenic, Valerianate of Zinc may be given in the following pill:—

R. Valerianate of Zinc	1 gr. = 0.065 gm.
Compound Pill of Asafoetida	2 gr. = 0.129 gm.

In hay fever one of these remedies should be commenced before the grass flowering season begins—that is, about the second or third week in May—and continued right through the hay-time. During an attack of hay fever Mackenzie recommends the internal administration of tincture of opium. It often relieves the paroxysm, but it is not a very safe drug to put into the hands of patients of this class, who are liable to overdose themselves in order to obtain relief. In paroxysmal rhinorrhœa a prolonged course of arsenic is generally most useful. A few cases will respond remarkably well to a combination of atropine and strychnine given in the form of a pill.

R. Sulphate of strychnine	$\frac{1}{30}$ gr. = 0.0022 gm.
Sulphate of atropine	$\frac{2}{60}$ to $\frac{1}{10}$ gr. = 0.00032 gm. to 0.00065 gm.

It is often necessary to increase the dose of atropine until the physiological effects of the drug are produced before the symptoms are relieved.

Careful attention to the general health is of great importance. The majority of sufferers being of the thin, neurotic, restless type, much good may be done by careful "over-feeding" combined with rest and regulated exercise. Often, if an extra stone can be added to the patient's weight, there is great amelioration of the symptoms. Healthy outdoor exercise stopping short of fatigue, early hours, the avoidance of social excitement and of overwork of all sorts, and change of air, are all useful adjuncts to any form of treatment. In severe cases a course of Weir-Mitchell treatment is of great service, and paroxysmal sneezing may sometimes be quite arrested by a course of high-frequency electrical treatment.

Local Treatment.—*Local Applications.*—A great variety of local applications, used chiefly in the form of a spray, have from time to time been recommended as specifics for these conditions. Many of them are certainly useful in arresting the symptoms for a time, but they are generally followed by a strong local reaction,

which in the long-run causes an aggravation of the malady. Amongst the drugs most powerful to arrest the symptoms are cocaine and supra-renal extract used singly or combined. In Tucker's cure, perhaps the most popular of all remedies, both are combined with atropine and some essential oils. These drugs certainly relieve the patient ; but, in order that the improvement may be maintained, they need to be applied more and more frequently and in stronger solutions. Inasmuch as sufferers from hay fever and paroxysmal sneezing are by the very nature of their complaint confessedly neurotic and therefore extremely likely to contract drug habits, it is most imprudent to put such remedies into their hands. It is wrong in hay fever patients in whom the affection lasts from a few weeks to a couple of months ; it is worse in sufferers from paroxysmal sneezing and rhinorrhœa, in whom the symptoms may persist all the year round. Much irretrievable harm has been done by recommending cocaine to both these classes of patients.

Another useful remedy, but one of doubtful advisability, is the opium pipe. A few whiffs are often sufficient to relieve the paroxysm and restore the patient to comfort, but what has been said above about cocaine must be said almost as strongly of opium-smoking.

The recently introduced *serum treatment* is not open to the same objections. Dunbar has proved that the pollen of certain plants causes hay fever, not by acting as a foreign body irritating a sensitive mucous membrane, but by the absorption of toxins contained in the pollen. These toxins he has separated, and with them has produced all the symptoms of hay fever in susceptible people, and he has further obtained an antitoxin by the injection of the toxins into horses. The effect of this antitoxin on hay fever has been investigated not only by Dunbar, but by Semon, Liebreich, and others, with results which justify its trial. It is now commercially prepared and sold as Pollantin in a liquid or a powder for local application to the conjunctivæ and nasal mucous membrane. It may be said that its *constant* use during the hay fever season will with many patients control the incidence, or at any rate mitigate the severity, of the attacks of hay fever. It is, in fact, a useful palliative remedy, and should be recommended in preference to the drugs already mentioned because it apparently causes no ill effects either generally or locally.

There remain several local applications which have proved

useful to certain individuals and which may be tried without much fear of harmful results ; but none of them can be considered universally applicable or even generally helpful. The following may be tried :—

(1) Collunarium Hazelin (p. 49). To be used as a spray during the attack and as a nasal wash night and morning.

(2) Rx. Chromic acid $\frac{1}{16}$ to $\frac{1}{8}$ gr. = 0.004 to 0.008 gm.
Glycerin 10 m. = 0.62 c.c.
Water 1 oz. = 30 c.c.

To be used as a spray.

(3) Insufflatio Bismuthi et Morphinæ (p. 33).

(4) Vapor Ammoniæ (p. 194).

(5) Vapor Tinet. Benzoin (p. 52).

(6) Nebula Menthol (p. 50).

In addition to these applications for the nose, a solution of 1 in 800 of perchloride of mercury applied to the conjunctivæ at the very commencement of an attack may act as an abortive.

Surgical Treatment.—This is perhaps the most important method of treatment in the majority of cases both of hay fever and paroxysmal rhinorrhœa. It consists in the correction of gross abnormalities, when they exist, and in the application of the cautery. There is no one definite lesion or deformity within the nostril which can be said to be always, or even generally, associated with these affections, but in a great many cases some slight or marked departure from the normal can be found, the correction of which is usually attended with beneficial results. The symptoms are generally alleviated, sometimes temporarily arrested, and occasionally permanently cured. The following are the abnormalities which may require surgical treatment : (1) Turgescence or hyperplasia of the inferior turbinals ; (2) Oedema or enlargement of the middle turbinal ; (3) Polypi ; (4) Deviation and spurs of the septum. The methods of treating these conditions have already been fully dealt with in Chapters ix. and xii. The object of surgical treatment for these conditions should be to render the nasal cavities as nearly normal as possible, and to keep them so. With this latter object in view hay fever patients should present themselves for examination the first week in May every year, and paroxysmal rhinorrhœa patients every three to six months, when any swelling of the mucous membrane should be cauterised or hyperplastic growths removed. These remarks are not meant to imply that every spur should be removed and every deviation corrected, for minor

degrees of septal deformity are quite compatible with absolutely healthy nasal cavities. If, however, the deformity is sufficient to cause nasal obstruction or persistent chronic rhinitis, it should be corrected.

Application of Cautery.—There remain a large number of cases in which no gross abnormality can be found, and in these relief may often be given by the use of cautery. In hay fever patients this should, for choice, be applied early in May before the flowering season commences, and in cases of rhinorrhœa during a quiescent period, if possible. Though the best results may be obtained in this way, much relief can be given by the careful application of cautery even during bad attacks. Most operators have their own favourite area for cauterisation. Some prefer the anterior ends of the inferior turbinals ; others the tubercle of the septum ; and others again the anterior ends of the middle turbinal. As a matter of fact some patients respond better to cauterisation in one area and other patients in others. It is best to start by making a fairly deep burn in the region of the tubercle of the septum on the left side, cutting across the boggy ridge, which can generally be found there. The following week this should be repeated on the right side. If this is of distinct benefit, the applications must be repeated at intervals of a week or ten days until complete relief or the maximum of improvement has been obtained. If there is no improvement, cautery may next be applied quite superficially (p. 34) to the anterior end of either middle turbinates alternately at intervals of a week. If the patient does not respond to cauterisation of either the septum or the middle turbinal, linear cauterisation of the inferior turbinals should be tried (p. 218). In a very few cases it may be possible to find some hyper-sensitive spots on examination with a probe, in which case these should be first cauterised. Such spots may occur on the septum, middle or inferior turbinals, but the region of the tubercle of the septum will almost invariably be found to be the most sensitive area, especially in cases of paroxysmal rhinorrhœa, so that it is a good routine practice to start cauterisation there. Two or three applications to each side of the septum are generally sufficient to arrest the symptoms for the time being. This treatment should be repeated for hay fever each May for a few years until the habit is entirely broken, or until the liability to attacks dies out with advancing years. In cases of paroxysmal rhinorrhœa a few sittings may be necessary every six months or so for some years.

Radical Operations.—Lastly, there are cases of a very aggravated type in which all these methods of treatment fail to give relief. The patients suffer acutely from the symptoms, and are incapacitated for weeks and even months at a time, and often lose a stone or more in weight. In such cases complete removal of the inferior turbinals may be performed with much benefit. The turbinals, however, being important physiological structures, such an extreme measure must, of course, be kept as a last resource, and is then only justifiable if the disease totally incapacitates the patient and leaves his health shattered when it passes off. This removal will nearly always relieve the nasal obstruction, often the most distressing of the symptoms, and may even prevent any further attacks, or at any rate render them so mild in character that nothing further is called for. Occasionally the attacks recur after a time and tend to resume their severity of type, in which case Lack has found that permanent relief can be afforded by removing the middle turbinals. In his patients complete removal of all the turbinals was not followed by dryness of the pharynx or other discomfort, probably owing to the fact that the whole mucous membrane secretes freely and readily in those who suffer from this class of affections.

Hydrorrhœa (*Idiopathic Rhinorrhœa*)

Definition.—A rare condition, characterised by a profuse watery discharge from one or both nostrils, usually occurring periodically once in twenty-four hours without any other marked symptoms.

The **Etiology** is very doubtful, but it generally occurs in neurotic individuals, and is probably itself a neurosis closely allied to paroxysmal rhinorrhœa; indeed, it is often difficult to draw a sharp line of distinction between the two complaints.

The chief **Symptom** is the sudden gush of fluid, which is generally clear and watery, but may be yellow-coloured or milky. Sometimes the discharge is preceded by irritation about the nostrils and occasionally by sneezing. As a rule, there are no pathological changes within the nose, though after the disease has persisted some length of time oedema of the middle turbinal or even a polypus may be found. This is probably a result and not a cause of the affection, and its removal does not arrest the discharge.

The **Treatment** is carried out on the same principles as that for paroxysmal rhinorrhœa both generally and locally (p. 359), but

as a rule alleviation is the most that can be achieved. The prognosis, however, is good, for it generally ceases spontaneously sooner or later.

Hydrorrhoea must be distinguished from the *escape of arachnoid fluid from the nose*, a condition called by St. Clair Thomson cerebro-spinal rhinorrhoea. In this condition there is a more or less continuous unilateral flow of clear watery fluid from the nose, increased by stooping or bending the head downwards. If the discharge ceases or lessens, unilateral headache and sometimes vomiting, drowsiness, or convulsive symptoms may supervene. The fluid escapes through the cribriform plate without any apparent cause.

The final diagnosis is based on the chemical analysis of the fluid, though headache, varying in an inverse ratio to the amount of the discharge, should suggest the true nature of the case.

Asthma

It has already been suggested (p. 355) that in people predisposed to asthma, attacks may be induced by persistent irritation in the nose, but this is not admitted by every one. There is, however, considerable evidence to show that in some instances asthmatic attacks and certain intra-nasal affections are closely associated.

In the first place, there are those cases of asthma connected with hay fever and paroxysmal rhinorrhoea, in which the nasal and bronchial conditions are closely associated, and in which successful treatment of the nasal symptoms is as a rule followed by relief of the bronchial symptoms. Secondly, the close connection between nasal polypi and asthma cannot be doubted. The removal of polypi has often cured asthma, and occasionally their incomplete removal has originated it in patients who had never before suffered from it. Lastly, asthma is also sometimes associated with deformities of the septum and hyperplasia and enlargements of the turbinate bodies, and may occasionally be arrested by the removal of such abnormalities.

The association of asthma with all these intra-nasal changes is too frequent to be a mere coincidence, and the fact that asthma may be so often relieved or even cured by treatment of the nose alone justifies the opinion that nasal disease in some instances is at any rate a contributory cause of asthma. But over and

beyond these cases the rhinologist will be consulted by asthmatic patients in whom the nasal cavities are practically normal, and then the question will arise whether any form of nasal treatment is likely to benefit them.

The Intra-nasal Treatment of asthma will therefore vary according to the presence or absence of gross abnormalities within the nose.

(1) **When gross abnormalities are present** they should certainly be attended to, but seeing that it is never possible to be sure that they are the exciting cause of the asthma, no extravagant promises of relief should be made. The following are the conditions which may have to be treated: polypi, enlargements and hyperplasia of either the inferior or middle turbinals, deviation and spurs of the septum, and adenoids. The methods of treating these conditions have been fully dealt with. It is worthy of note that polypi must be very thoroughly removed in order to relieve asthma permanently. It is often necessary to remove together with the polypi large portions of the middle turbinals, and in severe cases to perform the radical operation (p. 242), before more than temporary relief is obtained. In those cases where removal of polypi has caused asthma, probably only partial removal has been effected, and the asthma can as a rule be stopped by a further and more thorough operation. As regards spurs and deviations of the septum, if they are not causing obstruction nor signs of intra-nasal irritation, they are not likely to be in any way connected with the attacks of asthma, and should generally be left alone.

(2) **When the nasal cavities are normal.** Many rhinologists have long maintained that in some cases success will follow the application of cautery to the normal mucous membrane of the nose. As in hay fever each surgeon has his favourite spot for applying it, and undoubtedly all who have practised it have met with cases in which it has given at any rate temporary relief. Recently Francis has published a long series of cases in which he has obtained not only temporary but permanent relief by applying cautery to a certain region of the septum. The advisability and justifiability of such empirical treatment has been much questioned, but seeing how distressing habitual asthma is to the patient and with what serious consequences it may be attended in the course of years, any method which offers any prospect of affording even relief seems justified.

Francis's method should be first tried because it causes practically no destruction whatever of the mucous membrane. It consists in cocaineising the septum and in applying cautery to the smallest possible area with the lightest and gentlest touch at a spot just in front of the middle turbinal and a little below the tubercle of the septum. One side only should be done at a sitting, and the cautery should not be applied to the same side until the former wound has completely healed. In some cases improvement is immediate, but in other cases the cauterisation must be repeated many times before any results are obtained. If too much is done at one sitting the asthma is sure to be made worse, and the patient will be discouraged. The method requires patience both on the part of the surgeon and the subject, but Francis maintains that there are very few instances in which partial or complete relief are not obtained if the applications are continued long enough. A series of asthmatic patients treated by this method during the last two years quite corroborates Francis's views. In the worst cases really remarkable improvement has taken place, and in many of the milder cases complete relief has been obtained. Sufficient time has not elapsed to speak of the permanency of these results.

The older method of free and deep linear cauterisation of the inferior turbinals and the septum has been attended with a certain percentage of good results and, other methods failing, should certainly be tried. Sensitive spots, or so-called "asthma spots," may sometimes be located as in hay fever, and if found should be cauterised.

The general treatment of asthma is, of course, important, but for details of this treatises on general medicine must be consulted.

CHAPTER XIV

NEW GROWTHS OF THE NASAL PASSAGES

I. INNOCENT GROWTHS: *Papilloma*—*Fibroma*—*Angioma*—*Enchondroma*—*Osteoma*—Their Course and Treatment. II. MALIGNANT GROWTHS: *Sarcoma*—*Carcinoma*—Their Course and Treatment.

ALL new growths in the nasal cavities are rare, but almost any variety may be found. The following are the most usual forms:—

I. Innocent.

1. Papilloma.
2. Fibroma.
3. Angioma, or bleeding polypus of the septum.
4. Enchondroma.
5. Osteoma.

II. Malignant.

1. Sarcoma.
2. Carcinoma.

I. INNOCENT GROWTHS

1. **Papilloma.**—If hyperplastic outgrowths from the inferior turbinals (p. 214), which are sometimes classified as papillomata, be excluded, this form of growth is very rare. A papilloma, however, may be met with growing from the lower and anterior part of the septum, or from the true skin in the vestibule, or they may spring from the junction of the skin and mucous membrane.

The pathological appearances are typical of papilloma elsewhere. They give rise to no important symptoms.

Treatment.—When pedunculated and springing from the mucous membrane the papilloma should be removed with a cold wire snare under cocaine anaesthesia (p. 63), and the wound dried and cauterised with pure nitric acid; small sessile growths may be destroyed by the galvano-cautery. When the papilloma springs from the skin of the vestibule, it is usually better to snip it off with scissors or to excise it by an elliptical incision including a small area of healthy skin.

2. Fibroma.—Intra-nasal fibroma is very rare. Bosworth collected from the literature of the subject forty-one cases, in which a diagnosis of fibroma had been made, but the extreme rarity of this growth in the London Hospitals would suggest possible errors in diagnosis. Fibromata spring from the periosteum of the outer wall or roof of the nose or from the septum, and occur in the earlier period of life, usually between fifteen and thirty years. They contain numerous and large vascular spaces, and are sometimes spoken of as angio-fibromata.

The symptoms are gradually increasing nasal obstruction, muco-purulent and later purulent and blood-stained discharge, attacks of severe epistaxis, a slowly progressing deformity of the nose and face, headache, anosmia, and deafness; dysphagia and dyspnoea may occur if the growth extends into the pharynx. In appearance the surface of the growth is smooth and red, but often coarsely lobulated. It is hard and immovable, and highly resistant to pressure with a probe. Later, the exposed parts may become ulcerated. If left alone it causes death from exhaustion or encroachment on vital structures. If successfully removed, especially in the early stages, the prognosis is fairly good, but there is always a tendency to recurrence.

Treatment.—The only successful treatment is the complete removal of the growth, the exact method of accomplishing which will greatly depend on its size and attachments. If still small, it can be removed with a strong cold wire snare under cocaine anaesthesia. The growth is always tough, and the wire of the snare must therefore be proportionately strong. The loop is passed well up over the growth as near to its base as possible and then firmly and steadily tightened until the growth is severed. Bleeding must be arrested by pressure with cotton wool, and the electric cautery freely and deeply applied so as to destroy the periosteum to which the growth was attached. Some surgeons prefer the electric cautery ecraseur, but, except when it is possible to see exactly the position of the wire loop, the cold snare is preferable. Should the growth have attained such proportions that the successful use of the snare is impossible, some external operation for bringing the growth into view will be necessary (p. 372). Whatever the method employed, there is always very free haemorrhage, which adds greatly to the gravity of the operation.

3. Angioma or Bleeding Polypus of the Septum.—These

tumours are very rare, though several cases have been recently reported. The symptoms are gradually increasing nasal obstruction accompanied by frequent and often severe epistaxis. On examination a red vascular sessile tumour, which bleeds very readily on being touched with a probe, is seen growing from the cartilaginous septum, varying in size from that of a pea to that of a filbert. The prognosis is favourable if removal is thorough, but the tumours may recur.

Treatment.—Thorough removal is indicated. Local anaesthesia is first induced by the application of cocaine and supra-renal extract (p. 63). An incision is then made with a knife or cautery point through the mucous membrane down to the cartilage all round the growth and a short distance from it. The mucous membrane and perichondrium are then separated from the cartilage with a blunt dissector and removed, carrying the whole growth with it. In some cases the growth can be removed with a cold wire snare, after which its base should be thoroughly cauterised with the galvano-cautery both at the time of operation and again after a week's interval. The after-treatment consists in keeping the parts clean by the use of the alkaline nasal wash, and in applying some oily preparation, such as the menthol spray, to the wound to prevent the formation of crusts.

4. **Enchondroma** may very rarely occur as a large, smooth, sessile growth springing from the septum or roof of the nose. It slowly increases in size and causes exactly the same symptoms as a fibroma, except that there is not the same tendency to epistaxis.

The Treatment consists in its removal. In a few cases it may be possible to do this by intra-nasal methods, but if the growth has attained any considerable size, an external operation to expose the growth thoroughly is necessary (see p. 372).

5. **Osteoma**.—This variety of new growth is also very rare. Osteomata are generally pedunculated and of a pink colour, and they may spring from any part of the nose. In a case reported by Lack the tumour commenced in the anterior ethmoidal cells and protruded into the nose causing obstruction, and into the orbit displacing the eyeball. They are sometimes accompanied by polypi, which may conceal the bony growth. They give rise to gradually increasing nasal obstruction and neuralgia, and as the growth increases in size the further symptoms are in every way similar to those due to a fibroma.

Treatment.—Some external operation, varying according to the

position of the growth, must be devised in order to expose it and give room for its removal. In Lack's case the growth was exposed by a curved incision round the inner margin of the orbit, and its removal effected by cutting away a large part of the orbital plate of the ethmoid and a portion of the nasal process of the superior maxilla.

II. MALIGNANT GROWTHS

Sarcoma and Carcinoma.—Malignant tumours of the nose are rare, but sarcoma is of slightly commoner occurrence than carcinoma. Of the sarcomata, the small spindle-celled variety is the commonest, but round-celled sarcoma is also found: of the carcinomata, the alveolar variety and squamous epithelioma occur. Malignant growths may spring from any part of the nose, but the anterior part of the septum and the outer wall of the nose in the neighbourhood of the inferior turbinate are the favourite positions. Occasionally the growth originates in an accessory sinus, most frequently the antrum, and spreads into the nasal cavity.

The symptoms, course, and treatment of all varieties of malignant growths are very similar, and in the later stages it is often impossible to diagnose the exact nature of the tumour from the clinical appearances.

Pathological Changes.—In the early stages a spindle-celled sarcoma appears as a soft, smooth, rounded tumour with a broad deep attachment; it shows no great tendency to early ulceration, but as it grows it causes absorption of the bony structure, and so spreads beyond the nasal cavity. The round-celled sarcoma grows rapidly and soon ulcerates, and it then forms a soft sloughing friable mass. The alveolar carcinoma is at first a smooth and sometimes pedunculated growth, whilst the epithelioma occurs as a typical malignant ulcer with thickened everted edges.

The characteristic appearances of all these growths are, however, sooner or later lost, and examination reveals a large friable fungus-like tumour or sloughing mass, which is bathed in blood-stained purulent discharge, and bleeds readily on the slightest touch with a probe. The growth may be surrounded and hidden by oedematous mucous membrane or large polypi, which may lead to error in diagnosis. As the growth increases, it entirely

fills the nasal cavity and encroaches on the neighbouring parts: thus it may protrude into the naso-pharynx or project from the nostril; it may spread into the antrum or ethmoidal cells, perforate the cribriform plate, or displace or erode the floor of the nose and the septum; finally, it may distend the nasal cavities, and cause considerable external deformity.

Symptoms.—The most prominent symptoms are gradually increasing nasal obstruction, early and repeated epistaxis, pain in the nose, neuralgia, purulent discharge, often blood-stained and foetid, excoriation of the upper lip, and external deformity. Later, cerebral complications or symptoms of pressure on nerve trunks may be met with. Occasionally the growth may lead to suppuration within an accessory sinus, especially the antrum, causing characteristic symptoms (p. 264).

Diagnosis.—Malignant tumours have to be differentiated from simple tumours, nasal polypi, syphilis, tubercle, and lupus. The most important point to bear in mind is the fact that polypi and malignant disease may co-exist. If polypi occur in elderly people and are accompanied by pain, blood-stained discharge, attacks of epistaxis, deformity of the nose, or dilatation of the superficial veins of the skin, the possibility and even probability of malignant disease should be recognised. When the diagnosis is doubtful, a portion of the growth should be submitted to microscopical examination.

Prognosis.—This is of course very grave. If the patient is seen early, complete removal is possible, but, as a rule, he does not come under observation until the growth is so far advanced that the practicability of complete eradication is improbable. Even in these cases, however, extensive operations may very considerably prolong life.

Treatment.—The only radical treatment is, of course, operative; and the first question to decide is whether any operation can be devised by which the growth can be eradicated. The answer to this depends chiefly on the point of origin and size of the growth. Speaking broadly, growths springing from the anterior part of the septum, the floor or outer wall of the inferior meatus are the most favourable cases for operation; those springing from the base of the sphenoid and spreading chiefly towards the post-nasal space are the next best; whilst those springing from the ethmoid region or cribriform plate are the least favourable; and further, whatever the position may be,

the more limited the growth, the greater is the chance of ultimate success.

Growths in the front part of the nose may be dealt with by intra-nasal or by external operations. Intra-nasal curetting operations are sometimes partially successful, as shown by a case reported by Bond. A general anaesthetic is administered and the growth is scraped away with a curette, and the curetting is continued until the bone or cartilage is exposed. If the surface of the wound can be sufficiently dried the electric cautery or pure carbolic acid should be applied to the wound, but the haemorrhage is often so free that it may be necessary to plug the nose for twenty-four hours after the operation and cauterise the wound under local anaesthesia later. The patient is kept under supervision, and if any granulations or nodules appear, a second and even a third similar operation will be required.

If the growth is at all extensive it is better to expose it by an *external operation*. This can generally be done satisfactorily by Rouge's operation, which has the advantage of leaving no scar on the skin. It consists in lifting the upper lip and soft parts of the nose from the jaw and exposing the nasal cavities by an incision in the mouth. (See books on general surgery.) When a good view is obtained, the growth, with an area of healthy mucous membrane, is thoroughly removed. It is always advisable to introduce a sponge, with a tape attached for its easy withdrawal, into the post-nasal space before commencing the operation in order to prevent blood running back into the pharynx. If much haemorrhage is anticipated, a preliminary laryngotomy with the introduction of a sponge into the lower part of the pharynx will save much time and avoid the danger of blood entering the larynx and lungs.

Various other external operations have been devised for gaining access to the nasal cavities, all of which are attended with some success. Langenbeck's, Ollier's, and Dieffenbach's may be mentioned.

Growths springing from the ethmoidal region or roof of the nose are not favourable cases for operation. They are difficult to reach, they may have encroached on important organs, and their removal is attended with grave risks. If, however, the growth is small and localised, an attempt should be made to remove it under a general anaesthetic with a Meyer's ring knife, working outwards in precisely the same way as for the radical operation for removal of nasal polypi (p. 242).

Ollier has recommended external operation for exposing growths in this region. A skin incision is made round the top of the nose, the bones are divided at their junction with the forehead and turned downwards. The growth is then scraped away and the nasal bones replaced. Inasmuch as this operation does not afford the possibility of making a clean removal of the growth by dissection, it does not seem to offer much advantage over the intra-nasal method.

Growths springing from the base of the sphenoid are best exposed through the mouth by splitting the soft palate and removing as much of the hard palate as may be required with a portion of the septum, as recommended for tumours of the post-nasal space (p. 412).

In addition to the above methods, more extensive operations, involving partial or complete removal of the upper jaw, have been practised, but if the growth is sufficiently extensive to require this, there is but little chance of its complete removal.

Palliative Treatment.—If complete removal is impossible, relief may often be given by taking away as much of the growth as possible by means of a snare and curette, and then painting the wounded surfaces with a strong solution of nitrate of silver (60 grs. to 1 oz.). A dry slough forms which slowly separates. The effect of this in diminishing the discharge and in rendering the nasal cavity clean and the patient comfortable is often very striking. In other cases all that can be done is to alleviate pain and prevent as far as possible the evils of septic absorption. For the relief of pain, local applications are sometimes useful, the best of which is an insufflation of orthoform. If this be used every eight or twelve hours the patient may sometimes be kept comfortable. Morphia insufflations or a spray of cocaine may also be tried. Though one of these drugs locally applied may succeed for a time, it will eventually be necessary to administer opium by the mouth or morphine hypodermically. As the pain may be really severe, they should be given without hesitation.

To prevent septic absorption the nose should be kept as clean as possible with some mild antiseptic lotion, such as sanitas, listerine, or boro-glyceride. After one of these has been used, the nose should be swabbed out with peroxide of hydrogen and then again washed with some simple lotion. The patient should be instructed to expectorate as far as possible all discharge which may find its way into the pharynx and not to swallow it.

CHAPTER XV

EPISTAXIS, FOREIGN BODIES, RHINOLITHS

I. EPISTAXIS. Local Causes—General Causes—Treatment. II. FOREIGN BODIES. III. RHINOLITHS.

I. EPISTAXIS

EPISTAXIS, or bleeding from the nose, may be due to very many conditions, both local and general. It is rare in infancy, unusual in middle life, but common in children from four years old to puberty, and again in old age. It is commoner in males than in females.

The **Local Causes** may be thus classified :—

1. Mechanical violence, such as falls or blows on the nose, or surgical operations.
2. Rhinitis sicca, in which the haemorrhage is caused by the separation of a crust or by picking the nose (p. 299).
3. Varicosity of the veins of the anterior part of the septum, especially if slight injury occurs or rhinitis sicca exists. Sometimes the whole septum may be in a velvety vascular condition, which causes very troublesome epistaxis.
4. Adenoids, especially in children.
5. Intra-nasal tumours, especially malignant tumours, bleeding polypi of the septum, and fibromata.
6. Acute and chronic rhinitis, especially if there is any tendency to varicosity of the septal veins.
7. Atrophic rhinitis.
8. Syphilitic and tuberculous ulceration.
9. Foreign bodies and sequestra.
10. Hay fever and paroxysmal sneezing, rarely.
11. Leprosy, in which it is one of the earliest symptoms.

General Causes.—Epistaxis is met with in the course

of very many general diseases, which may be classified as follows:—

1. Diseases which increase the arterial tension and lead to cardiac hyperplasia, such as interstitial nephritis, valvular disease, &c.
2. Diseases interfering with the free return of the blood to the heart, such as bronchitis and emphysema, mitral stenosis, whooping-cough, pneumonia, &c.
3. Cirrhosis of the liver.
4. Acute specific fevers, such as typhoid fever, influenza, diphtheria, rheumatic and relapsing fevers.
5. Diseases of the blood, such as haemophilia, purpura, scurvy, chlorosis, anaemia, leukæmia, and malaria.
6. Tumours pressing on the great veins of the neck and checking the return of blood from the head.
7. Great or prolonged exertion of any kind.
8. Arrested menstruation.
9. Rarefied air and extremes of temperature.

Pathological Changes.—On examination of the nose between the attacks, one or other of the local causative conditions enumerated above may often be found. When the result of some general disease, the haemorrhage generally arises from the anterior part of the septum, where some slight departure from normal can often be seen at a spot about a quarter of an inch from the vestibule and a quarter of an inch from the floor of the nose. This is called the “site of predilection” for epistaxis, because in the absence of any gross lesion the haemorrhage so often arises from this area. There may be slight or marked dilatation or varicosity of the veins, or the mucous membrane may be spongy and elevated or eroded, or again it may be pale and atrophied with dilated veins coursing over its surface. If haemorrhage has recently occurred, a brown or black crust, varying in size from a mere dot to that of a threepenny piece, can generally be seen. Whatever the exact appearance of the mucous membrane, even gentle probing will usually lead to free haemorrhage. Though this area is by far the most usual source of haemorrhage from the nose, epistaxis may also arise from the anterior ends of the inferior turbinals, from an artery in the floor of the nose, from a vessel in the vestibule, from

veins in the posterior part of the nose, or from the anterior ethmoidal veins.

Diagnosis.—Hæmorrhage from the nose may flow backwards and be swallowed and subsequently vomited, or it may lodge in the pharynx and be coughed up through the mouth. In the former case it may be thought to be due to gastric ulcer and in the latter to phthisis, but a careful examination of the nose will usually reveal the source of the blood. On the other hand, hæmorrhage originating elsewhere may find an exit through the nose; thus bleeding from the pharynx, larynx, lungs, or stomach must be excluded, and, in traumatic cases, fracture of the base of the skull must not be overlooked.

Prognosis.—As far as the immediate attack is concerned the prognosis is good, for it generally stops spontaneously or can be arrested by appropriate treatment. As regards prevention of further attacks, the prognosis is also good when the hæmorrhage is due to a purely local cause, except of course when it is secondary to malignant disease or to an inoperable fibroma. When epistaxis is dependent on a general condition, the prognosis is much graver. If due to increased arterial tension it may be taken as a danger signal, betokening the likelihood of a cerebral hæmorrhage, for it often signifies degenerative changes in the blood-vessels which is probably shared by those of the brain.

Treatment.—Epistaxis does not always require treatment, but when it does the method will depend on whether it is of local or general origin. As a rule cases due to morbid general conditions require chiefly general treatment, whilst those due to local causes require local treatment, sometimes combined with general measures.

General Treatment of Cases due to General Disorders.—In healthy robust children and youths the attack is generally salutary; and provided the bleeding stops spontaneously before an excessive loss has occurred, no treatment is necessary. Again, in patients with degenerated vessels and high arterial tension the epistaxis is often beneficial and prophylactic of graver troubles: no special measures are therefore required to stop it. Lastly, in patients suffering from diseases which prevent the return of blood to the heart, a smart hæmorrhage from the nose is frequently attended with the greatest relief. In all such cases the patient should sit quietly with the head bent slightly forward so that the blood may run out of the nose and may

not be swallowed. Between the attacks the general condition must receive careful attention. A careful general examination must be made, and treatment suitable to the disorder found must be adopted.

Local Treatment of Cases due to General Disorders.—As just stated, no local treatment is as a rule required, but if the haemorrhage continues until the patient is becoming blanched or exhausted, active measures must be taken to arrest it. The patient should sit with the arms raised above the head, and all clothes about the neck loosened. Cold applications must be made to the bridge of the nose, forehead, and nape of the neck, whilst the feet and legs are immersed in hot water. If at hand, small pieces of ice may be introduced into the nostrils and allowed to run back into the pharynx, or the nose may be gently syringed with iced water or water at the temperature of 110° Fahrenheit, to either of which salt in the proportion of a tea-spoonful to a pint is added. If these simple means fail, the nose should be carefully examined, and the bleeding spot if possible localised. If it is at the site of predilection, a tampon of cotton wool soaked in a 5 per cent. solution of supra-renal extract should be introduced and pressure brought to bear on it through the ala for ten minutes or so. This is generally successful, and the tampon can be gently removed, though it may be left in the nose for twenty-four hours in very severe cases, for fear its withdrawal should re-start the bleeding. If the blood is coming from above the middle turbinal, its source is generally the anterior ethmoidal veins, and a strip of gauze packed between the middle turbinal and the septum will usually arrest it. If these measures fail, obliteration of the bleeding vessel with the cautery or plugging the nasal cavity may be necessary, the methods of doing which have already been discussed (p. 72).

General Treatment in Cases due to Local Causes.—Frequently recurring severe epistaxis may reduce the patient to the pitiable condition characteristic of continuous loss of blood from any cause, and general treatment may be very necessary. Complete rest in bed for a few days or weeks, according to the gravity of the condition, with careful generous feeding, will do much in itself to relieve the patient; but iron, either in the form of Blaud's pills or of the tincture of the perchloride of iron combined with strychnine, should at the same time be given. As the patient

recovers, plenty of fresh air and graduated exercise combined with intervals of complete rest are desirable. Finally, change of air to the seaside or a sea trip will help to establish completely convalescence. Further, in addition to the local lesion which is the immediate cause of the epistaxis, some predisposing general condition may be recognised, which will require appropriate treatment before local measures can be entirely successful.

Local Treatment in Cases due to Local Causes.—This naturally consists in removing the cause as far as possible. Dilated or weakened veins on the septum should be obliterated by means of the galvano-cautery (p. 32), dry scabs should be gently removed and their re-formation prevented by the use of the alkaline hand-wash (p. 29), followed by the application of the nebula menthol or the nebula hydrargyri nitratis (p. 50), either of which may be used as a spray or freely applied to the affected part on a camel-hair brush. Adenoids, foreign bodies, or intra-nasal tumours may have to be removed, and syphilitic or tuberculous affections dealt with.

In those rare cases where the mucous membrane covering a large area of the septum has undergone a kind of vascular degeneration, causing constant oozing of blood with occasional outbursts of profuse haemorrhage, the application of the cautery is generally insufficient. In a case reported by Hunter Mackenzie the mucous membrane was dissected off the cartilaginous septum and removed, and in a case shown at the Laryngological Society it was finally necessary to remove a great part of the cartilaginous septum together with the mucous membrane covering both its surfaces.

II. FOREIGN BODIES

As a rule foreign bodies are wilfully inserted through the nostril by children or hysterical women, but they may gain access from behind during vomiting, or during deglutition should coughing or sneezing suddenly occur. In the former case nearly any article small enough to enter the nostrils may be found in the nose, and in the latter case particles of food, fruit stones, and other hard substances may be discovered. In the tropics, parasites and maggots may find their way into the nose, and various fungi are sometimes met with.

Symptoms.—If the foreign body has been long within the nose, a unilateral purulent and generally foetid discharge,

unilateral nasal obstruction, and excoriation of the ala and upper lip are the chief symptoms, to which are sometimes added a nasal twang to the voice, earache, and lachrymation. On examination the nasal mucous membrane is found to be red and injected, and the inferior turbinal swollen, whilst the nasal cavity is filled with pus, muco-pus, or a pseudo-membranous exudation, or the foreign body may be surrounded and hidden by granulations.

Diagnosis.—Though occasionally there may be some difficulty in excluding bone disease, polypi, tumours, and unilateral atrophic rhinitis, mistakes can hardly be made if care is exercised. In unilateral fibrinous rhinitis, however, the symptoms are so closely similar that real difficulties may arise, and a definite diagnosis can often only be made by exploring the nose with a strabismus hook or hooked probe. If a foreign body is detected, it should be forthwith removed in the manner described below.

Treatment.—If the child is manageable, a little cocaine is applied to the inferior turbinal in the usual way (p. 63), and with the help of a good illumination a strabismus hook is passed backwards above the foreign body with the point directed upwards. Directly the hook has passed beyond the foreign body it is turned downwards and the handle raised, and then quickly but gently withdrawn, dragging the foreign body with it. Forceps are sometimes used instead of a strabismus hook, but if the foreign body is smooth and hard, the blades are apt to slip off it, and drive it further into the nose: moreover, the operation cannot under any circumstances be so quickly performed with forceps, and the child is liable to get restive and frightened before it is accomplished. Another advantage of the hook is that when once it is in position the extraction of the foreign body is helped rather than otherwise if the child pulls back his head.

If the foreign body is far back in the nose, or if the child is frightened and restless, a general anæsthetic must be given and the foreign body carefully removed with hook or forceps. This can generally be done without any difficulty, but care must be taken not to push the foreign body back into the post-nasal space for fear that it should find its way into the larynx. A finger passed through the post-nasal space into the choana will prevent this accident.

Expulsion of the foreign body by means of syringing or by politzerisation through the unaffected nostril has been recommended, but such methods are likely to cause infection of the Eustachian tubes and tympanic cavities and to be followed by acute otitis. They should therefore be avoided.

III. RHINOLITHS

Rhinoliths, or nasal concretions, generally form round a foreign body, but occasionally a blood clot or even inspissated mucus may act as a nucleus round which the salts may be deposited. Altered nasal secretions due to chronic rhinitis, coupled with any cause leading to the retention of the secretions, such as deviations, spurs and hypertrophies, seem to favour their formation.

The symptoms are the same as those caused by foreign bodies, but a rhinolith may in addition cause distension of the nasal cavity and deformity of the nose by its gradual growth.

The only **Treatment** is removal. If of small or medium size, this can generally be effected by means of a strabismus hook or forceps under cocaine anaesthesia. If of large dimensions, a general anaesthetic must be administered and the stone crushed and removed in pieces, care being taken that no fragments reach the larynx. When the patient has recovered from the anaesthetic, the nose should be syringed from the sound side so as to wash away any small pieces which may have been left behind, as the smallest fragment, if allowed to remain in the nose, may act as a nucleus for fresh calculus.

SECTION IV

DISEASES OF THE NASO-PHARYNX

CHAPTER XVI

ADENOIDS

Definition—Etiology—Pathological Changes—Clinical Results. Symptoms—Local and Distant—Treatment—Prophylactic, Medicinal, Surgical.

Definition.—A hyperplastic enlargement of the adenoid tissue normally met with in the mucous membrane of the naso-pharynx and often spoken of as the Pharyngeal or Luschka's Tonsil.

Etiology.—The most important *exciting causes* of adenoids are acute and chronic catarrh of the nose and naso-pharynx and the acute infectious fevers, of which scarlet fever, measles, and diphtheria may be especially mentioned, though any acute inflammatory affection of the upper air-passages may lead to hyperplasia of the pharyngeal tonsil. Catarrhal conditions being so often responsible for adenoids, the causes of acute and chronic rhinitis (pp. 189, 210) are amongst the chief *predisposing causes* of adenoids. Of other predisposing causes sex, age, heredity, and climate must be mentioned. They are about equally common in either sex, and usually commence between the third and seventh year of life, though they may occur during the first few months, or persist and even commence quite late in life. As regards *heredity* there seems no doubt that the liability to tonsillar enlargements runs in families and even in races. This may partly be accounted for by the strong tendency there is in some families, and in the whole Hebrew race, to acute or chronic catarrhs. *Climate* certainly exercises a considerable influence on the frequency of tonsillar enlargements. Damp, cold, and changeable atmospheric conditions favour their occurrence, probably by causing, in the first instance, catarrhal conditions of the upper respiratory passages.

Pathological Changes.—By posterior rhinoscopy the enlarged pharyngeal tonsil can be seen on the upper and posterior walls of

the naso-pharynx, cutting off from view the upper part of the posterior end of the septum and of the choanae (Figs. 178 and 179). In young children vertical ridges of pale and soft growth, separated from each other by deep fissures (Fig. 180) may be seen ; in older children the growth appears to be coarsely lobulated ; whilst in young adults a single and central rounded pad with a smooth red surface can generally be observed. If the case is complicated by severe chronic rhinitis the posterior ends of the inferior turbinals are often seen to be enlarged.

Clinical Results.—On systematically examining a child with

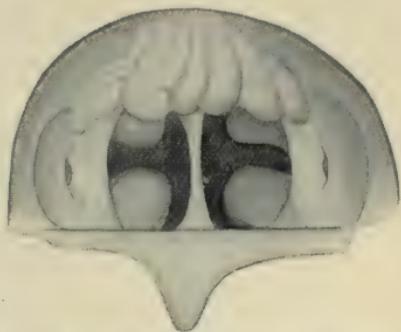


FIG. 178.—Adenoids as seen by posterior rhinosecopy.

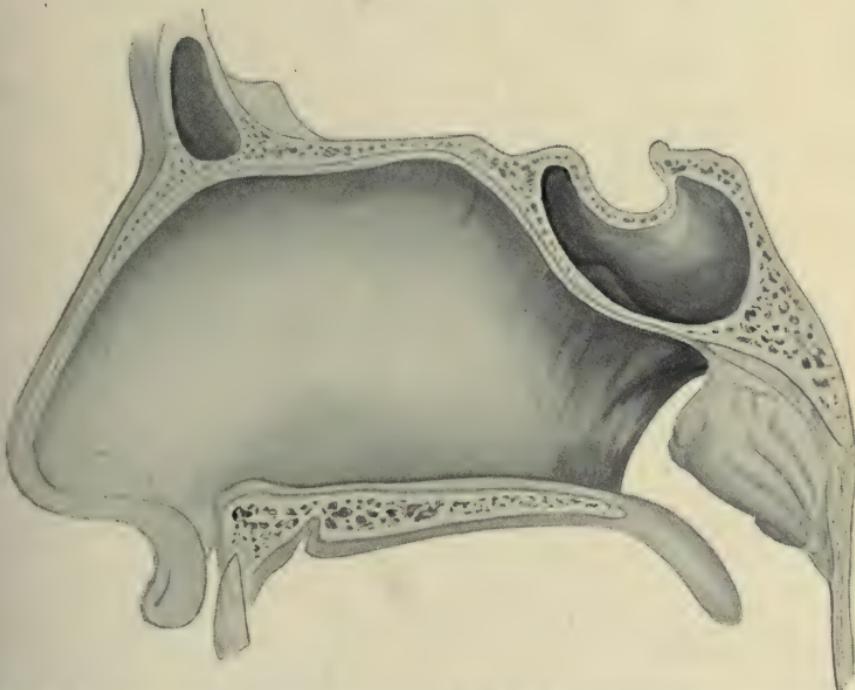


FIG. 179.—Antero-posterior section through the skull showing adenoids of the naso-pharynx.

adenoids serious changes may be noticed in many surrounding and even distant parts of the body. These changes may be conveniently classified as follows : 1. In the face. 2. In the nasal cavities.

3. In the mouth and tongue.
4. In the pharynx.
5. In the neck.
6. In the thoracic walls.
7. In the ears.

1. *In the Face.*—Children suffering from adenoids acquire a peculiar and characteristic facial expression, of which the following are the chief features: Broadening of the bridge of the nose, collapsed and dimpled alæ nasi, narrow slit-like nostrils, open mouth, expressionless upper lip, and prominent lower lip. Muco-pus is often seen in and around the nostrils, which may lead to redness and excoriation of the alæ nasi and upper lip. These



FIG. 180.—Adenoids after removal (Lack).

changes when typically developed cause a stupid and even semi-idiotic appearance, most disfiguring to the child (Fig. 181).

2. *In the Nasal Cavities.*—In a great many cases, though not invariably, examination of the nasal cavities reveals all the signs of simple chronic rhinitis. The inferior turbinals are red and tumefied, the meatuses are filled with a thick muco-purulent discharge, and the mucous membrane is sodden, red, and inflamed. In older children and young adults there may be true hyperplasia of the inferior turbinals.

3. *In the Mouth and Tongue.*—The chief changes met with in the mouth are alterations in the shape of the jaws and position of the teeth. If the nasal obstruction and consequent open mouth are at all of long standing the arch of the palate will be seen to have become very high (Fig. 182), and the upper alveolar border more or less V-shaped, the apex of the V being directed forwards. The consequence of this contraction of the

jaw is overcrowding and irregularity of the teeth (Fig. 183). Similar alterations may be observed in the lower jaw, only not to so marked an extent (J. Turner). Until lately these deformities of the jaw were thought by many to be congenital, but more recent observations point strongly to their being the result of



FIG. 181.—Facial appearances in a case of adenoids.

buccal breathing due to nasal obstruction (p. 222). The tongue is often thickly coated, which is in some instances possibly due to keeping the mouth open, but more frequently to digestive disturbances caused by swallowing the muco-pus which runs down from the post-nasal space.

4. *In the Pharynx*.—The usual changes met with in the pharynx are enlargement of the faucial tonsils, large flat granulations on the posterior wall getting larger as the naso-pharynx is approached, and the down-flow muco-pus from the naso-

pharynx. These appearances are practically diagnostic of adenoids. Enlargement of the faecal tonsils in children practically never occurs without hyperplasia of the pharyngeal tonsil, though the



FIG. 182.—Exceptionally high arched palate in a male aged twenty-two, the result of nasal obstruction.

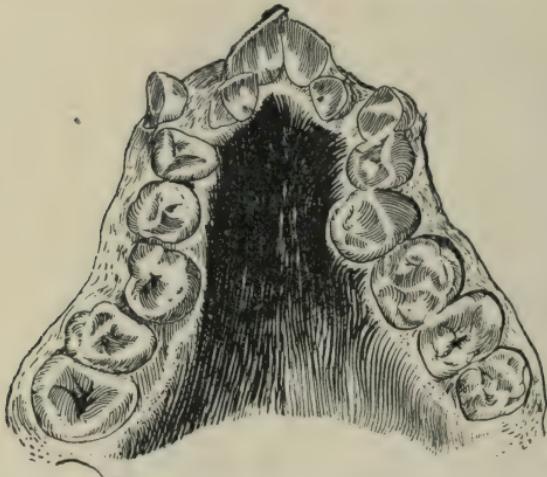


FIG. 183.—Irregularity of the teeth in a case of long-standing nasal obstruction (after Lack).

reverse is by no means the case; the flat elevations on the posterior wall are themselves hyperplastic lymphoid tissue, similar to adenoids. In adults the pharynx is often dry and glazed in consequence of buccal breathing.

5. *In the Neck.*—Enlarged glands of the neck are a very constant sign of adenoids. A chain of small glands along the

posterior margin of the sterno-mastoid muscle can nearly always be found, and when the faucial tonsils are also affected the glands in the anterior triangle are enlarged as well. The enlargement is generally inflammatory and due to slight septic absorption from the unhealthy pharyngeal tonsil, but in some cases secondary tuberculous infection occurs.

6. *In the Thoracic Walls.*—A transverse constriction of the chest (Harrison's furrow) and pigeon breast are both commonly met with (Figs. 184 and 185). They are the result of nasal breathing during sleep in spite of the obstruction, at an age when the ribs are soft and yielding. They are especially common when adenoids and great enlargement of the faucial tonsils co-exist, for then both nasal and buccal breathing are impeded.

7. *In the Ears.*—Three distinct pathological conditions may be found in the ears : (1) Recurrent acute otitis media ; (2) Chronic dry inflammation of the middle ear ; and (3) Chronic suppuration of the middle ear.

Acute attacks of otitis media are perhaps the most frequent and characteristic of the affections of the ears due to adenoids. The attack is accompanied by ear-ache and deafness, and sometimes by suppuration and perforation of the drum. As a rule the discharge ceases, the perforation heals, and the hearing power returns to nearly normal, but any attack may be followed by chronic suppurative otitis, and the deafness may be progressive. Chronic dry inflammation of the ear is met with when adenoids are associated with chronic catarrhal rhinitis, and is due to an extension of the inflammatory process to the Eustachian tube and middle ear. At first the drums are slightly retracted, thickened, pink and fleshy-looking with a bright shiny surface. Later the usual signs of chronic otitis media sicca are present : the drums are yellow-grey in colour, opaque, thickened, markedly indrawn and wanting in lustre, and the bright spot is either lost or broken up. Whilst the drums are still in the earlier stage the deafness will be relieved directly the adenoids are removed, but in the later stage some after-treatment will be required before the hearing is fully restored.

Chronic purulent discharge is, as already stated, a sequel to acute otitis media. It occurs chiefly amongst hospital patients, in whom the acute attack is more likely to be neglected.

Symptoms.—In addition to the pathological changes or signs of adenoids just enumerated there is a very long list of symptoms

traceable directly or indirectly to their existence. In order to understand many of these it is necessary to remember that children



FIG. 184.—Deformity of the chest resulting from adenoids and enlarged tonsils, from a photograph taken one week after their removal.

with adenoids adopt buccal breathing by day, but persist in nasal respiration during sleep in spite of the obstruction, and

despite the fact that the mouth is kept widely open (Macdonald, Parker, and others). The deformities of the chest and many of



FIG. 185.—The same patient as shown in Fig. 184, four months after the removal of tonsils and adenoids, showing the result of the operation combined with the regular practice of the breathing exercise described on page 408.

the symptoms would be inexplicable were buccal respiration constantly adopted. The symptoms of adenoids may therefore be

classified into those due to buccal breathing by day; those due to persistence of nasal breathing during sleep; those more directly due to the adenoid mass; and certain reflex neuroses.

(A) *Symptoms due to Buccal Breathing.*

Chronic pharyngitis, laryngitis, and bronchitis with liability to acute exacerbations, and in children to the group of symptoms commonly called "Croup" (p. 489).

(B) *Symptoms due to Persistence of Nasal Breathing.*

1. Broken sleep, struggling for breath, nightmare, and night-terrors.
2. Deficient aeration of the blood, causing—
 - (a) Anæmia and general debility.
 - (b) Malnutrition and stunted growth.
 - (c) Headaches, giddiness, and loss of memory.
 - (d) Stupidity and inaptitude for mental exertion, especially on waking in the morning.
 - (e) Epileptiform convulsions occurring during sleep.
 - (f) Night sweats.
3. Snoring.
4. Nocturnal incontinence of urine. This may sometimes be a reflex disturbance.

(C) *Symptoms more directly due to the Presence of Adenoids.*

1. Thick speech with a nasal quality.
2. Inability of infants to suck.
3. Frequent colds.
4. Frequent attacks of pyrexia due to slight septic absorption from the growth.
5. Chronic catarrh of the nose and naso-pharynx, accompanied by profuse muco-purulent discharge.
6. Deafness.
7. Disorders of the stomach consequent on swallowing the discharge.
8. Epistaxis.
9. Anosmia.

(D) *Reflex Neuroses sometimes Attributable to Adenoids.*

1. Asthma.
2. Hay fever.
3. Stammering.
4. Barking or croupy cough.
5. Epilepsy and chorea (very rarely if ever caused by adenoids).

Of the above long list of signs and symptoms those most usually complained of by the parents are the open mouth and alteration of the shape of the nose, snoring and restlessness at night, mental dulness, deafness, frequent acute catarrhs, and croupy cough.

The symptoms of adenoids in adults between the ages of twenty and thirty-five are not nearly so marked or numerous as they are in children, but are still fairly definite. Those chiefly complained of are deafness, post-nasal catarrh, more or less nasal obstruction, chronic pharyngitis and laryngitis, impairment of the voice, especially by voice-users, and sometimes tinnitus even in cases where there is no other ear complication.

Diagnosis.—The diagnosis of adenoids is generally quite easy. The history of the case and the signs and symptoms usually point definitely to their presence. As a rule with a little patience a view can be obtained and a definite diagnosis made, but occasionally a digital examination must be carried out (p. 16). This is especially necessary when the adenoids have been previously removed, for all the symptoms will occasionally persist though the naso-pharynx be free from growth. Such cases are generally due to abnormally narrow nares with collapse of the alæ nasi, or to enlargement of the inferior turbinals. The growths feel soft and velvety or spongy to the finger, and bleed easily on being touched. Occasionally a small portion of the growth comes away on the tip of the finger. The conditions which must be excluded in making a diagnosis are: hypertrophy of the posterior ends of the inferior turbinals, polypus in the naso-pharynx, fibroma or other new growths, retro-pharyngeal abscess, and abnormal prominence of the second and third vertebrae. Very rarely congenital bony occlusion of the posterior choanæ may occur, producing many of the signs and symptoms of adenoids. Entire absence of nasal breathing and inability to pass a probe into the post-nasal space from the anterior nares suggest the deformity, but a definite diagnosis can only be made by careful digital examination of the naso-pharynx.

Prognosis.—If left alone adenoids generally become fibrous and contract after puberty, and often disappear altogether, though the ill-results which they cause during childhood are often permanent. When removed at an early age, a good recovery from all the usual symptoms may be predicted, but the prognosis as regards reflex neuroses, such as epilepsy or asthma, is always doubtful.

TREATMENT

Prophylactic Measures.—Acute and chronic catarrhal rhinopharyngitis being the most frequent source of hyperplasia of the pharyngeal tonsil, measures to prevent these affections become the most important method of guarding against adenoids. Such measures (p. 196) should therefore be carried out most carefully in children predisposed to catarrhs, especially if there is a history of adenoids in the family. Should a cold be contracted, its careful treatment is very important, especially in the third or muco-purulent stage (p. 195). It is probably the irritation and vascular turgescence caused by the presence of a muco-purulent discharge bathing the mucous membrane of the post-nasal space which causes the adenoid enlargement, and it is therefore necessary to cut short this stage of a cold and to arrest the discharge as quickly as possible. Attention to the general health by means of tonics, and when possible by a change of air, is important. Locally, the chief indication is to keep the nasal passages free from discharge. This is best effected by means of the alkaline (p. 29) or hazelin (p. 49) collunarium employed two or three times a day. It may be sniffed from the palm of the hand or used with an irrigator or spray (p. 46), but syringing and douches should be avoided (p. 29). It is also of the utmost importance to teach the child to blow his nose. In recent cases the adenoid growth is often not sufficient in itself to necessitate buccal breathing by day or to cause markedly difficult nasal respiration by night; but a profuse muco-purulent discharge in addition to the adenoids leads to great nasal obstruction and its consequences, and to a further increase in the size of the adenoids. Thorough cleansing of the nostrils, especially before the child goes to bed, should therefore be insisted on.

Medical Measures.—In slight cases in which there are no marked symptoms, and again in children reaching the age of puberty, medical measures may be adopted. In recent cases the enlargement is often chiefly due to hyperæmia or inflammation resulting from catarrhal rhinitis, so that resolution may be reasonably expected with appropriate treatment. Again, in children reaching puberty it is reasonable to watch and wait, because at puberty the nose and naso-pharynx develop rapidly in size, so that a growth, which was causing some obstruction, then ceases to do so, and also because after puberty there is a tendency for the

growth to become firmer and more fibrous and to diminish in size.

Medical measures consist in attention to the general health and in the use of local applications, the former of which is the more important. The child should be removed from damp or unhealthy surroundings, and if possible sent to the seaside or to some high, dry, and bracing inland place. Attention should be paid to proper feeding and to regulated outdoor exercise. Tonics are sometimes useful, the most beneficial of which is the syrup of iodide of iron, given three times a day after food in doses varying according to the age of the child from twenty drops to one teaspoonful well diluted with water.

Locally, the measures just recommended under preventive treatment should be carried out, and especially the nose should be kept clean and free from discharge by the use of the washes and the handkerchief. It has been recommended that the post-nasal space should be painted by the surgeon with some astringent, such as a solution of perchloride of iron (2 dr. to 1 oz.) or glycerin of tannin, but the use of paints is very distressing to the small patient and of very doubtful benefit. Occasionally the use of a mild astringent after cleansing the nose with the alkaline wash seems to be of some service. For this purpose the following may be recommended :—

Glycerin of tannic acid	3 dr.
Water	3 oz.

One teaspoonful to be added to a wine-glass of warm water and injected through the nostrils with an irrigator or spray.

Before passing on to surgical measures a few words must be said as to the method of treatment by means of breathing exercises so strongly recommended by Arbuthnot Lane for the cure of adenoids. It consists in placing the patient flat on his back with the mouth firmly closed and making him breathe deeply in and out through the nose for half-an-hour once or twice daily. If the obstruction is slight and the symptoms are chiefly due to co-existent catarrh, this method is a useful adjunct to the medical measures just described. If, however, the nasal obstruction is at all marked, nothing but harm can result from breathing through the nose in spite of the obstruction. It has been pointed out above that many of the signs and symptoms of adenoids are the direct result of nasal respiration in spite of obstruction during

sleep, and it is unwise to run the risk of increasing their severity by making the child deliberately adopt nasal respiration by day. To prove this point it is only necessary to strip a young child with marked adenoids and make him carry out these breathing exercises. The great recession of the chest with each deep inspiration must convince an unbiased observer that such breathing exercises had better be postponed until the obstruction has been removed.

Surgical Measures.—Complete removal of the growth is the only surgical measure applicable to cases of adenoids. Before describing the operations certain preliminary considerations must be discussed.

Indications.—The removal of adenoids is not entirely free from risk to the child's health and even life, as will be seen presently, and some discretion is therefore necessary in selecting cases for operation. On the one hand, there are instances in which the deleterious effects of adenoids are so evident and so grave, that no doubt can arise as to the necessity of their removal. On the other hand, adenoids may be discovered occasionally in considerable quantity without there being any serious symptoms traceable to their presence, in which case no operation need be performed at the time, though parents should be warned that the growth will have to be removed should the patient ever have earache or become deaf after an acute catarrh. Between these extremes there are cases in which doubt may arise as to the necessity of operation. The presence of one or more of the following conditions may be considered an indication for operation: Restlessness or snoring at night, mental dulness, frequent catarrh, constant croupy cough, even slight deafness, pigeon breast, disorders of digestion, and frequent attacks of pyrexia.

Amongst the doubtful cases there are those in which the usual signs are almost or entirely absent but the child suffers from one of the neuroses sometimes associated with adenoids, such as asthma, epilepsy, chorea, stammering, or nocturnal enuresis. Speaking generally, if the growth is not of sufficient size to cause the more usual symptoms, it is very unlikely to be responsible for distant reflex neuroses. The importance of the size of the growth is purely relative to the size of the space which it occupies. A really big growth in a large post-nasal space may do no harm, whilst quite a small growth in an unusually small space may cause obstruction and its consequent symptoms. If, however, adenoids are causing

any symptoms at all, and no other cause for the neurosis can be found, it may be justifiable to remove the adenoids, but a very guarded prognosis should be given as regards the neurosis.

In adults deafness, mouth breathing, and persistent post-nasal catarrh are the chief symptoms calling for the removal of adenoids.

The Risks of Operation, which must be borne in mind in coming to a decision or in helping the parents to do so, are those of the anæsthetic and the operation itself, of immediate and recurrent haemorrhage, of acute otitis media, pneumonia, and sepsis. The liability of children to acute infectious fevers immediately after the operation should perhaps also be mentioned. Though several deaths are on record, the immediate risks of the anæsthetic and the operation are very slight in skilled hands. Most specialists in anæsthetic work agree that operations about the nose and throat require greater knowledge, care, and attention on their part than almost any other operation. Skill, dexterity, and celerity are also necessary on the part of the operator in order to reduce the risks to a minimum. *Hæmorrhage* at the time of the operation is always free and sometimes for the moment alarming, but it always stops directly the operation is finished and need never cause any real anxiety. Cases of severe recurrent haemorrhage have however occurred, and one or two deaths from this cause have been recorded. As a rule it ceases spontaneously when the patient becomes faint, but if not measures must be adopted for arresting it (p. 72). *Acute otitis media* is a somewhat common accident. It may be due to blood being forced up the Eustachian tubes during the operation, but is more frequently the result of septic infection after the operation. It is therefore commoner amongst the poorer classes who return to insanitary surroundings immediately after the operation. It is rarely seen in patients who are either in nursing homes or in sanitary houses. *Pneumonia* may be due to blood entering the lungs during the operation or to infection afterwards. It is of rare occurrence. Slight and occasionally severe *septic poisoning* may occur any time within the first week after operation. Antiseptic precautions during the operation and hygienic surroundings afterwards reduce this risk to a minimum. Occasionally, though fortunately with extreme rarity, very severe cases of septic infection occur, leading to acute otitis, mastoiditis, and infection of the lateral sinus with general blood poisoning, which sometimes results in death. Finally, the risk of acute infectious

fevers is real, though slight if careful precautions are taken until the wound is healed. The practice of operating and sending the patient home at once in public conveyances is on this account unadvisable.

One other unusual complication must be mentioned, namely, *paresis of the palate*. This may occasionally occur, and is due either to injury at the time of operation or to inflammatory infiltration of the palate, the result of sepsis after the operation. It gives rise to the typical cleft-palate speech, and sometimes to the return of fluids through the nose. If due to injury, it is first noticed within forty-eight hours of the operation ; if to sepsis, any time within the first ten days. In either case it need cause no anxiety, since the muscular activity of the palate will recover itself without any special treatment in the course of a few days or weeks, according to the severity of the injury or of the inflammatory process.

The Anæsthetic.—A general anæsthetic is always necessary. Operative measures without one are to be condemned unhesitatingly, because they must be totally inefficient or absolutely brutal. The choice of the particular anæsthetic to be employed is an important question. It must be varied according to the patient's age, broadly speaking in the following manner :—Under three years of age, chloroform and alcohol (1 part of alcohol to 9 of chloroform) ; between three and six, A.C.E. mixture ; between six and fifteen, nitrous oxide gas or chloride of ethyl followed by ether ; over fifteen years, nitrous oxide gas alone or mixed with oxygen. Chloroform alone requires very careful administration, and, except in the case of infants, should not be employed.

The degree of anæsthesia induced is also an important matter, for it is essential that the patient should be able to swallow blood in the pharynx and cough up any that may find its way into the larynx. On the other hand, it is necessary to produce muscular relaxation, for the operation is rendered difficult if the soft palate is too active. In the first instance, the anæsthetic should be carried to the third degree, as shown by fixation of the eyeballs and contraction of the pupils in the case of chloroform, and by loss of the conjunctival reflex under ether. Then the patient should be allowed air, and just as the third stage is passing back to the second stage, that is, when the lid reflex is just apparent and the ocular globes rotate, the operation should be undertaken. In this way light anæsthesia is secured and incomplete narcosis

avoided, which is an important point for the safety of the patient.

The Position of the Patient.—This is also a question of some importance. In older patients, when gas alone is administered, the sitting posture is convenient and safe, but whenever a longer anaesthesia is induced the patient should be placed lying down on an operating table. This is especially important when chloroform is given. The exact position for the operation itself has also been the subject of some discussion. Some surgeons prefer the patient on his side, others on his back with his head extended over the end of the operating table. Both positions have their advantages and disadvantages, and the decision as to which should be adopted depends entirely on which of them best lends itself to the dexterity and celerity of the individual surgeon, for the great desideratum in all operations about the throat, where the bleeding is likely to be free, is thoroughness combined with the greatest possible expedition.

Whether tonsils, if enlarged, should be removed first or last is another point which has been discussed, but the decision may be left to the choice of the individual operator, as no claims can be put forward for either procedure sufficiently strong to make one pre-eminently better than the other. As regards instruments, some surgeons prefer the curette and others the forceps, whilst others again maintain that the most thorough removal can only be effected by using both. There is no doubt whatever that one or other of these instruments is essential for a complete removal, and that the use of the finger nail or of a scraper fitted on to the index finger is quite useless and should be entirely abandoned.

Methods of Operation.—Enlargement of the faucial tonsils so frequently co-exists with adenoids, that their removal will be included in the following descriptions. Allowing for slight variations according to the operator's likes and dislikes, the following methods will generally be found efficient for the removal of adenoids and tonsils.

(1) **In Children under Fifteen Years with Prolonged Anaesthesia.**—The patient is placed on his back on the operating table with the head slightly raised on a pillow ; the operator's hands are thoroughly cleansed and the instruments sterilised by boiling. The chosen anaesthetic is then administered, and Doyen's mouth gag (Fig. 186) is introduced. The operator stands on the right side of the patient and gently examines the tonsils and naso-pharynx with the index finger of the left hand, with the object not only

of finding out the size of the tonsils and the amount and distribution of the adenoid growth, but also of ascertaining the exact stage of anaesthesia which has been induced. If the finger can be

introduced behind the palate without causing any reflex movements the patient is too deeply under for safety, and it is better to wait a minute or two before commencing.

Being assured that the patient is able to

cough and swallow, a tonsillotome after Mackenzie's pattern (Fig. 198, p. 453) is introduced into the mouth with the right hand, and guided over the patient's left tonsil with the help of the left index finger. Directly it is in position the cutting blade is sharply pressed home, severing the tonsil. The tonsillotome is then immediately

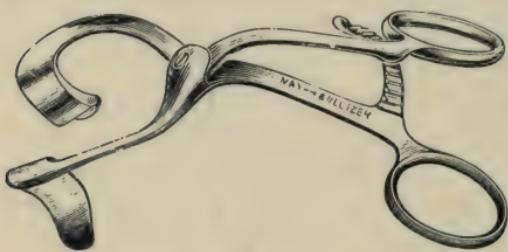


FIG. 186.—Doyen's mouth gag.



FIG. 187.—Loewenberg's forceps.

withdrawn by depressing the handle outwards and downwards in the angle of the mouth and sweeping the cutting end forwards and upwards towards the opposite corner of the mouth, so that the severed tonsil is lifted out on its surface. This requires a little dexterity, but it is important, because if the tonsil slips into the pharynx, it delays the operation, and may cause alarming symptoms by blocking the upper part of the larynx. The right tonsil is then removed in the same way as the left, except that the duties of the two hands are reversed. The pillow is then removed and the head is allowed to fall back over the end of the table, or the patient is

turned on his side facing the surgeon, and Loewenberg's forceps or one of its modifications (Fig. 187), is introduced into the naso-pharynx, and, under the guidance of the left forefinger, as much of the growth as possible is included within its blades and twisted off and removed. This is repeated once or twice until the bulk of the growth has disappeared. If the growth is at all tough and difficult to twist off, which is generally the case when a previous attempt has been made to remove it, and is sometimes so even in first operations, the tip of the forefinger should be pressed against the pharynx immediately below the piece to be removed. This will prevent tearing and stripping up the mucous membrane, an accident which is not unlikely to happen in such cases unless this precaution is taken. Gottstein's curette, or one of its modifications (Fig. 188), is then introduced and passed upwards until it is in contact with the septum, and it is then pressed upwards and



FIG. 188.—Post-nasal curette.

backwards against the vault of the naso-pharynx and swept downwards. This is repeated once or twice. Finally, the finger is introduced and a careful examination is made to make sure that no growth is left. Occasionally a little is found in the arches of the posterior choanae or in Rosenmüller's fossæ, which should be carefully removed. The lower part of the naso-pharynx and the pharynx itself should be included in this examination to make sure that no tag of growth is left hanging there attached by a shred of mucous membrane, an accident not unlikely to occur after the use of the curette, and one which causes troublesome coughing and hawking when the patient recovers from the anæsthetic.

Directly the operation is finished the child should be turned right over almost on to his face, so that the blood may run out of the mouth and nose. The gag is then at once removed and the face sponged with cold water. The bleeding, though very free during the operation, generally ceases directly the gag is removed. In simple cases all these steps can generally be carried out without any necessity for sponging the pharynx, but in other cases it may be advisable to wipe out the blood two or three times in the course of the operation. Sponging is objection-

able because it is apt to bruise the palate, which is followed by some pain and discomfort in swallowing. It is claimed by those who operate with the patient on his side that the blood runs into the cheek and can be wiped away without touching the soft palate, but in any case reasonable gentleness will avoid bruising or after discomfort. If the patient is on his back and difficulties arise likely to prolong the operation, he should at once be turned on to his side and the operation finished in that position. If the posterior ends of the inferior turbinals are sufficiently large to require removal, the tonsils had better be left till last, and the patient had

better be on his side during the whole operation.

For the method of removing the posterior ends of the turbinals, see p. 221.



FIG. 189.—Bark's gag.

(2) **Operation under Gas in Older Children and Adults.**—The patient should be seated in a dental chair so placed that a good direct or reflected light falls into the pharynx when the mouth is opened. A prop is introduced between the teeth on the right side of the mouth and the gas is administered. Directly the patient is under its influence a gag should be introduced into the left side of the mouth and the prop quickly withdrawn, or instead of this a Bark's gag (Fig. 189) may be introduced before the anæsthetic is commenced, by which a little time is saved. The operator's left forefinger is then introduced into the naso-pharynx, and almost simultaneously the curette is passed under the soft palate and carried forwards till it touches the posterior end of the septum. It is then pushed upwards and backwards directed by the finger until the blade is in the angle formed by the septum and the vault of the naso-pharynx. The finger is now withdrawn and the curette is swept downwards over the vault and posterior wall of the pharynx, keeping in the middle line. This is repeated rapidly two or three times in succession, sufficient pressure being exercised to keep the cutting blade of the curette in contact with the pharyngeal wall. The finger is again introduced to make sure that all the growth has been removed. The tonsils, if enlarged, should then be quickly removed with a tonsillotome. If there is not much haemorrhage this may be done by direct vision, but if the pharynx is full of blood, the tonsillotome should be guided into position with the left forefinger. Directly the operation is completed the patient's head and trunk must be bent forward over a bowl so that the blood

may escape from the mouth, and directly consciousness has returned the mouth is washed out with cold water. Though this is a simple operation it requires care, otherwise that portion of the growth immediately behind the posterior choanae may be missed altogether, and although the bulk of the growth may have been removed the symptoms will be unrelieved. This difficulty can be overcome by making sure that the curette is in contact with the septum, and that at the same time it is pressed well home against the vault of the pharynx. Again, it is not uncommon to leave behind a small portion of growth attached to the lower part of the naso-pharynx by a tag of mucous membrane which has been torn up by the curette. When the effects of the anæsthetic have passed off this piece of growth, hanging loose in the pharynx, generally causes violent coughing, retching, and hawking. The pharynx, therefore, must always be carefully illuminated and examined, and if a semi-detached portion of growth be found, it must be removed with forceps. This accident can generally be avoided by using a sharp curette.

This operation is quite satisfactory in well-grown adolescents and adults, but in smaller children there is a risk of blood entering the larynx, and moreover gas does not allow sufficient time to perform a thorough operation.

In adults destruction of the growth by means of the galvanocautery has been recommended, but it is difficult and tedious, and not devoid of danger.

After-treatment.—All patients should be kept in bed for twenty-four or forty-eight hours after the operation, and young or weakly children a further twenty-four hours, or longer if there is any rise of temperature. They must be kept indoors a further two, three, or four days according to their age and conditions of weather, and all risks of catching cold should as far as possible be carefully avoided for three or four weeks after the operation. If the patient suffers pain, constant sucking of ice is very beneficial, but as a rule after the first few hours the discomfort is limited to a feeling of stiffness. A brisk purge is generally required twenty-four hours after the operation to clear away the blood which has been swallowed, especially if it has not been rejected from the stomach by vomiting. Food should be cold and liquid or semi-solid for the first twenty-four hours, and of a light nature until the bowels have been opened. If the case goes on well no local applications should be made during the first week, but if the breath becomes disagreeable or the nose

and post-nasal space become filled with a profuse muco-purulent discharge, and especially if there is any rise of temperature, the alkaline nasal wash (p. 29) should be sniffed up the nostrils very gently two or three times daily. In young children unable to sniff the nose should be very gently syringed or irrigated, but forcible syringing or douches should be avoided as they greatly increase the risk of infection of the ears. In most cases it is advisable to order a cleansing nose lotion at the end of the first week, so as to keep the passages free from discharge and clear up any co-existing nasal catarrh. If the tonsils have been removed the throat should be frequently washed with the permanganate of potash gargle (p. 57), and if there are signs of inflammation about the wounds, the parts should be cleansed with cotton wool sponges saturated with a 10 vol. solution of peroxide of hydrogen.

When deafness complicates the case some after-treatment is often necessary before the hearing is thoroughly restored. In the more recent cases, as already pointed out (p. 387), the hearing is as a rule immediately and permanently benefited by the removal of the adenoids, though in some instances one or two Politzer's inflations may expedite matters. In more chronic cases a course of systematic treatment is often necessary.

The otitis being the result of chronic catarrh of the nose and naso-pharynx, the first step is to treat the latter condition by the continued use of alkaline lotions; by the cauterisation of the inferior turbinals, if they continue to be turgescent; by the removal of hyperplastic growths, if any exist; and by other methods suggested for chronic rhinitis (see p. 216). If the posterior ends of the inferior turbinals are enlarged, but not sufficiently so to have required removal at the time of operation, the swelling nearly always completely subsides under simple treatment, and no special measures are necessary. The next step is to inflate the middle ears by gentle politzerisation. This should not be commenced for a fortnight after the removal of the adenoids for fear of causing acute otitis, but then it should be carried out every day for a week, then twice a week for a fortnight, and finally once a week until the maximum amount of hearing is regained. The effect of the inflations must be carefully watched, for it is very easy to overdo them, both in force and frequency. It should never be done with more force than is necessary just and only just to open the Eustachian tubes and allow air to enter the tympanic cavities. The hearing should be

carefully tested before and after each inflation, and if politzerisation decreases the hearing power it should be abandoned, at any rate for a time ; or if a point is reached where no further improvement occurs it is better to desist. By this treatment, in all except very long-standing cases, the hearing may be expected to become almost, if not quite, normal. In cases of chronic suppurative otitis media great care and attention should be given in order to arrest the suppuration and procure healing. If sufficient personal attention is given success will usually result after the adenoids have been thoroughly removed. For the details of the various methods of treating this condition text-books on diseases of the ear must be consulted.

There are various other complications of adenoids which may require some treatment after the cause has been removed. Deformities of the chest may be greatly benefited by regulated gymnastics and by breathing exercises. The habit of keeping the mouth open may persist and require attention. Breathing exercises through the nose are most useful in correcting this fault also ; besides which much may be done by constantly reminding the patient to keep the mouth closed. The following breathing exercise is very simple and is strongly recommended. The patient is placed on a bed flat on his back with the shoulders supported by a pillow and the head thrown slightly backwards so that the shoulders are a little higher than the head. His hands, extended over his head, should grasp the rails at the head of the bed. He should then be instructed to take a slow deep inspiration through the nose whilst at the same time gently pulling against the head of the bed with his arms. By this means the extraordinary muscles of inspiration are artificially, so to speak, brought into play, and it is possible to fill the chest to a much greater extent than usual. At the end of this inspiration there should be a pause of one or two seconds before expiration is commenced. Expiration should be very slow and should empty the chest again as far as possible. This cycle is slowly repeated and continued for from five to ten minutes, but must be stopped if any sense of discomfort arises. The whole process should be carried out every morning and evening, and once in the middle of the day.

Very often the speech remains thick and nasal in quality, especially in older children who have long had nasal obstruction. Much may be done by frequent correction on the part of the parents

or friends, and by personal effort on the part of the patient ; but, if it persists for any length of time, a course of lessons in voice production should be advised. Occasionally this defect is in part due to a paretic condition of the palate, the result of the adenoids and post-nasal catarrh. This may be overcome by gargling the throat with iced water, and by the use of special speaking exercises which bring the soft palate into play.

Results of Operative Treatment.—The final results of the removal of adenoids depend entirely on the thoroughness of the operation. In nearly all cases there is at first a marked improvement, but, if some of the growth has been left behind, this is only temporary ; the symptoms gradually return and six months later are almost as bad as before the operation. If, however, the operation has been thorough and complete, the improvement is permanent, especially when the after-treatment above advised is carefully carried out. All the symptoms are relieved and generally in six months' time, or even in less, the parents express the opinion that the patient "is quite a different child." Both physical and intellectual growth make a start, sleep becomes peaceful and quiet, dulness and apathy disappear, colds and "feverish attacks" become rare, and deafness is a thing of the past. There is no minor operation in the whole of surgery which has more beneficial results. There are, however, occasional disappointments, even after the most careful and thorough operation. Mouth breathing by day, snoring by night, "cold catching," and other symptoms continue. These cases are very difficult to account for, but are probably due to anatomical peculiarities. They are most frequently met with in children with narrow aquiline noses and pinched nostrils, and with unusually contracted post-nasal spaces. In such cases it is all the more important to remove the adenoids, but there should be some reservation in giving a prognosis. Development of the alæ nasi (p. 349) and systematic breathing exercises will do a great deal to prevent disappointment after operation. If the operation has been undertaken for some reflex neurosis, the result is always doubtful. Asthma in children is often cured, but the other neuroses, though often arrested for a time, generally recur.

Chances of Recurrence.—This is a question on which the surgeon generally has to express an opinion before the parents give their consent to operation. Broadly speaking the younger the patient the greater are the chances that a second operation may be necessary,

and therefore in children under four years of age the parents should be warned that there is a risk of so-called recurrence, but at the same time immediate operation should be insisted on if the adenoids are producing serious symptoms. In children between four and eight years the chances of recurrence are very small, and in those over eight years they are practically *nil*. This is always supposing that the operation, when undertaken, is absolutely thorough and complete, for there is no doubt that most of the so-called recurrences are really cases of incomplete removal. In very young children it is improbable that all the adenoid tissue normal to the part is removed and it is possible that the causes, which originally led to hyperplasia, may persist and lead to hyperplasia of the remaining adenoid tissue. Apart from this the chances of recurrence seem to be increased by acute catarrh soon after operation, by frequent or neglected catarrhs, by acute specific fevers, and by the patient being the subject of congenital syphilis.

CHAPTER XVII

POST-NASAL CATARRH. TUMOURS. FOREIGN BODIES

I. *Post-Nasal Catarrh.* II. *Tumours*—Fibroma—Sarcoma—Epithelioma.
III. *Foreign Bodies.*

I. POST-NASAL CATARRH

THE term post-nasal catarrh signifies a collection of mucus, muco-pus, or pus in the post-nasal space. The discharge is often sticky and tenacious, and sometimes dries into dome-shaped crusts. As a rule post-nasal catarrh is but a symptom of catarrh of the nasal cavities, the discharge being carried backwards by the cilia. Some of the unhealthy secretion may, however, arise from the mucous membrane of the naso-pharynx itself, which becomes secondarily inflamed from irritation caused by the nasal discharge, and in a few instances the naso-pharynx may be alone or at all events principally affected.

Etiology.—Post-nasal catarrh being in the majority of cases secondary to inflammation of the nose, the causes of acute and chronic rhinitis are indirectly the causes of post-nasal catarrh, but certain factors seem to influence the occurrence of inflammatory changes in the mucous membrane of the naso-pharynx. They are, for instance, frequently associated with residence in a cold damp climate subject to sudden and great variations of temperature. In America, where it is very prevalent, Mackenzie thought that dust was the chief exciting cause. Excessive use of condiments, alcohol, and tobacco are certainly aggravating if not immediate causes of the trouble, and it is also intimately associated with the flatulent type of dyspepsia. Finally, many cases are kept up at all events by the remains of adenoid hypertrophy, or are due to a true folliculitis of the lymphoid tissue of the naso-pharynx, similar to follicular disease of the faucial tonsils.

Pathological Changes.—The appearances found in the post-nasal space vary with the cause. When due to chronic rhinitis the changes in the post-nasal space correspond to those in the nose; that is, they will depend on the dry or muco-purulent

character of the rhinitis. When due to climatic influences the mucous membrane generally looks soft and boggy or velvety, and the discharge is profuse, sticky and muco-purulent; when due to alcohol or other irritants the mucous membrane is dry, very red and shiny, and the discharge is scanty and often encrusted; when due to old adenoids, pads of thickened tissue can be seen. Sometimes there is a central rounded pad with inflammation of the mucous membrane covering it; in other cases there are several small elevations giving the vault a rough irregular appearance; and in others still there are two lateral pads adhering together in front and behind, and leaving a bursa-like cavity between them (Fig. 190). The slit-like opening of this cavity is generally central, but it may be towards one side or the other, or there may be two slits at irregular intervals. Secretions may collect within these slits, or crusts may block their openings, and the retained secretions on their escape are intensely irritating to the naso-pharyngeal mucous membrane. Tornwaldt first described these

bursa-like cavities, and the condition is often spoken of as "Tornwaldt's disease." When the catarrh is due to folliculitis the mucous membrane of the naso-pharynx looks granular and is studded by numerous little yellow spots. Finally, in post-nasal catarrh the lateral bands of the pharynx are often enlarged and give rise to pain or discomfort (see Pharyngitis Hyperplastica Lateralis, p. 445), and middle ear complications are of common occurrence.

Symptoms.—The most prominent symptom is the hawking out of sticky or dried discharge from the post-nasal space, especially on waking in the morning. Dome-shaped crusts are often expectorated and brought for the surgeon's inspection. If the discharge is profuse, retching and even vomiting may occur. The voice is generally altered in tone and character, and sometimes suggests that due to paralysis of the palate, by the inactivity of which it is probably caused. There are complaints of dull aching pain in the throat and considerable pain in the back of the neck.

Diagnosis.—Though post-nasal polypi and tumours may give rise to many of the symptoms of post-nasal catarrh, an examina-



FIG. 190.—Bursa-like cavity between two lateral pads of adenoids.

tion with the mirror or with the finger will quickly settle any doubt in the diagnosis. Real difficulty, however, may often arise in determining whether the discharge is due to chronic rhinitis or unhealthy mucous membrane in the naso-pharynx, or whether it has travelled back from one or other of the accessory sinuses. In disease of any of the anterior set, but most commonly when the antrum is affected, the discharge may be carried backwards and collect in the naso-pharynx, if the intra-nasal structures are normal and the cilia healthy and active. The anterior part of the nose must be carefully examined for any trace of pus; whilst the antra must be trans-illuminated (p. 267), and, if found to be dark, punctured and irrigated (p. 269). It is important to remember that pus or muco-pus in the naso-pharynx may be literally the only symptom of empyema of the antrum (p. 264). In disease of the posterior sinuses it is usual to find some pus in the naso-pharynx, especially when the sphenoidal sinus is affected. It is generally scanty and has a tendency to dry into crusts, which may be seen on the vault of the pharynx, or on the upper surface of the posterior end of the middle turbinate.

Prognosis.—In old-standing cases complete cure is not often obtained, but in recent cases the prognosis is more hopeful. Treatment, however, will always alleviate the symptoms and keep the patient comfortable.

Treatment.—Both general and local treatment are necessary. The *general* treatment should include the proper regulation of the diet; the prohibition of alcohol, pungent condiments, and tobacco; the adoption of suitable measures for the regulation of the bowels, and the correction of flatulency and indigestion. When the digestion is satisfactory, arsenic, or in winter cod-liver oil, should be given. Both these drugs often act beneficially on the catarrhal process, and improve the general tone of the patient. If the patient live in a cold and damp climate, change of residence to the seaside or some high, dry, and bracing locality may be recommended temporarily or permanently.

As to *local* treatment it is of the utmost importance to remove all the discharge and to keep the post-nasal space absolutely clean. If the discharge is allowed to collect and remain in the naso-pharynx it increases the inflammation, and so leads to an increased amount of discharge. Cleanliness is best effected by frequent use of the alkaline or some other mildly disinfectant lotion every night and morning, and as often during the day as may be necessary.

sary to get rid of the discharge. The lotion can be sniffed through the anterior nares from the hand or used by means of a post-nasal syringe (Fig. 33, p. 30). If there is chronic rhinitis, the nasal cavities must be treated according to the exact conditions found (see Chap. ix.). If the mucous membrane of the naso-pharynx is much affected, paints are very beneficial. When the discharge is muco-purulent and fairly profuse, strong astringents, such as nitrate of silver (60 gr. to the oz.), chloride of zinc (30 gr. to the oz.), sulphate of copper (40 gr. to the oz.), are useful, especially the nitrate of silver. It is necessary to use considerable caution in applying them for fear of laryngeal spasm (p. 38). These strong astringents should not be used if there is much tendency to dryness or crust formation, in which case it is better to swab out the naso-pharynx with glycerin of borax, boro-glyceride, Mandl's fluid (p. 38) or menthol (2 per cent. in paro-leine). Mackenzie recommends a powder containing eucalyptus gum one part, and starch three parts. It is applied daily by means of a post-nasal insufflator, and the proportion of eucalyptus is gradually increased.

If there is even a small pad of adenoids, it should be removed, especially if Tornwaldt's bursa is present. If there are no adenoids, but the mucous membrane is rough, swollen, and boggy, a thorough curetting will often arrest the disease.

The success of these methods of treatment depends greatly on the persistence shown both by the surgeon and the patient, perhaps chiefly by the latter. By the regular use of washes it is always possible for him to keep himself comfortable, and often in time entirely to arrest the catarrhal process.

II. TUMOURS OF THE NASO-PHARYNX

Both innocent and malignant tumours originating in the post-nasal space are rare. Amongst the innocent growths which occur, the fibromata are the most frequent and most important. A slow-growing pedunculated tumour, called by some a *fibro-myxoma* and by others a fibro-mucous polypus, may occur (Fig. 191), but presents no special features. Such tumours are generally attached to the posterior part of the middle turbinate or outer wall of the nose, and are probably ordinary nasal polypus in which fibrous tissue has become excessive owing to irritation from exposure of the growth in the naso-pharynx. They have no

tendency to recur and should be removed by one of the methods described for an ordinary polypus lying in the post-nasal space (p. 240). *Cysts* may occur in connection with adenoids, and should be removed with the adenoids by means of forceps or curette. Isolated instances of chondroma and adenoma have been recorded.



FIG. 191.—Fibro-mucous polypus.

As regards malignant tumours, both sarcoma and carcinoma may be met with.

Fibroma.—A fibroma originating in the naso-pharynx presents many of the special features already alluded to in connection with a similar tumour originating in the nasal cavities (p. 369). Though structurally innocent it has a tendency to increase gradually in size, to invade surrounding regions, and to recur after removal. They almost always commence at or about puberty, and grow till development is complete, when it is said that their activity ceases and they may even diminish. They are much commoner in males than in females.

Pathological Changes.—When seen in situ either by means of the post-nasal mirror or by lifting the palate, the tumour presents a smooth uniform and globular aspect, varying in colour from pale pink to dark purple, with large blood-vessels coursing over its surface. It is generally attached to the roof of the naso-pharynx slightly to one side of the middle line. As the tumour grows, it becomes coarsely lobulated, completely fills the naso-pharynx, and often hangs down into the oro-pharynx, or spreads forwards into the nose, where it may be seen by anterior rhinoscopy and produces all the symptoms of a fibroma originating in the nose (p. 369). It may cause absorption of bony partitions and thence invade the accessory sinuses, the orbit, or the cerebral cavity.

Symptoms.—The first symptoms are catarrh of the naso-pharynx and increasing nasal obstruction. Then follow the usual train of

symptoms due to severe nasal stenosis, of which deafness and great pain in the ears, thickness of speech, and severe neuralgia, are especially marked. Frequent and severe attacks of epistaxis, uncontrollable sleepiness coming on at any time, together with a feeling of intense fatigue, are especially suggestive of post-nasal tumours. As the tumour grows, external deformities of the nose, dysphagia, and dyspnoea may occur, or symptoms of cerebral complications may arise.

Diagnosis.—A small fibroma may resemble an ordinary polypus which has become reddened and firm from exposure. A polypus is pedunculated and originates within the nose, whilst a fibroma has a broad attachment to the roof of the naso-pharynx, so that digital examination will determine the diagnosis. It is often extremely difficult to differentiate between sarcoma and fibroma. Probably no hard and fast line can be drawn between them either clinically or microscopically.

Prognosis.—If a fibroma is left alone it usually causes death by extension. If seen whilst it is still possible to remove it the prognosis is more hopeful, even though it may recur. If it is a fact that the tendency to recurrence ceases at about the age of twenty-five, and the growth can be kept within limits by operative measures until after that age, recovery may eventually take place. If seen and treated quite early one complete and thorough operation may be successful.

Treatment.—Operative measures offer the only chance of eradication, but the exact measures to be adopted must vary according to the size of the growth. If the growth is quite limited in extent, the cold wire or galvano-cautery snare may be employed, at any rate on the first occasion. Larger tumours, if they are still chiefly confined to the naso-pharynx, and recurrent tumours, must be removed through the mouth after splitting the soft palate. If the tumour has greatly encroached on the nose and accessory cavities, larger operations, involving partial or complete removal or resection of the upper jaw, may be undertaken if they offer a reasonable prospect of eradicating the growth.

Removal by means of a Snare is carried out in the same way as removal of a large post-nasal polypus, the details of which have already been described (p. 240). It is necessary to remember that a fibroma is extremely vascular and that alarming haemorrhage may occur. The actual cutting through the base of the fibroma should therefore be done very slowly, but if violent

hæmorrhage commences, the remainder of the growth should be quickly severed and the post-nasal space tightly packed with gauze (p. 74). All the necessary instruments for laryngotomy or tracheotomy, according to the age of the patient (p. 75) should be at hand, in case blood should enter the larynx and interfere with respiration.

Removal through the Mouth is thus carried out:—A general anæsthetic having been administered, a preliminary laryngotomy or tracheotomy is performed, and the upper part of the larynx packed with a sponge to which a tape is attached. The patient's head is then extended over the end of the operating table and so arranged that a good light will fall into the mouth. A Smith's gag is introduced, with which the mouth is held wide open and the tongue depressed. A good view of the parts having been obtained, the soft palate is firmly held with long dissecting forceps, and split through the middle line with a sharp knife. A long suture is then passed through the incised edges and each half of the palate is pulled outwards and forwards, by which means a fair view can be obtained of the growth. Its attachments are then defined by digital examination, and if parts of the growth still remain inaccessible, the central incision is carried forwards over the hard palate severing the mucous membrane and periosteum for an inch or more. If it is necessary to remove much of the hard palate, other incisions should be made outwards at right angles to the anterior termination of the central incision. The soft parts are next turned off the bone and as much of the hard palate and posterior part of the septum nasi as are necessary must then be chipped away with a gouge or chisel. When the tumour is thoroughly exposed to view an incision down to the bone is made all round its attachment fairly wide of the growth, and then with an elevator, assisted by curved scissors, the mucous membrane and growth are separated from the bone and removed. The hæmorrhage is often profuse, but seldom alarming, provided the incision has been made quite free of the growth. It can generally be controlled by sponge pressure. The exposed bone should be thoroughly curetted with a sharp spoon and then the actual cautery or pure nitric or carbolic acid applied. Finally the incision over the hard palate and that through the soft palate should be carefully united with sutures, the sponge pulled out of the larynx and, if hæmorrhage has ceased, the laryngotomy tube removed. If there are any fears of renewed

haemorrhage the tube should be left in position for twenty-four hours.

Sarcomata and Epitheliomata.—Primary malignant disease of the naso-pharynx, especially epithelioma, is extremely rare. Bosworth gives a good *résumé* of nineteen cases of sarcoma and six of epithelioma. The symptoms of both are much the same as those of fibroma, except that the discharge sooner becomes irritant and offensive. Epistaxis, moreover, occurs quite early in the case, and the general health is affected earlier and more profoundly. In appearance a sarcoma presents an irregular rounded and somewhat lobulated aspect, has a greyish muddy-looking colour, and on palpation is found to be soft and pultaceous. The glands are generally though not invariably enlarged. A positive diagnosis can often be made only by a microscopic examination of the growth, for which purpose a small portion can easily be removed by means of punch forceps.

An epithelioma of the naso-pharynx differs in no way from epithelioma elsewhere. If a satisfactory view can be obtained with a mirror the characteristic ulcer with raised everted edges is seen, and on examination with the finger the characteristic hardness is found. Enlargement of the glands of the neck occurs early and is often out of all proportion to the size and activity of the primary growth. An unobserved epithelioma in the naso-pharynx accounts for some of those cases of malignant glands of the neck, in which the primary growth has not been discovered.

The Prognosis in both sarcoma and epithelioma is extremely grave. Unless seen very early operation fails to eradicate the disease.

Treatment.—If seen quite early, the operation through the mouth, just described for fibroma, or some modification of it, offers the best chance of thorough removal of the growth. In practice, however, cases are seldom seen in which the growth is limited to the naso-pharynx. It has generally spread to other parts, and the glands of the neck often on both sides have become affected, so that there is but little prospect of complete removal. Under these circumstances it is probably best to adopt such palliative measures as may keep the patient comfortable and free from pain. Occasionally however in cases of sarcoma, the progress of the disease has been modified, and increased comfort has been afforded to the patient by removing as much of the growth as possible with a snare, and by repeating the operation as soon as may be necessary.

III. FOREIGN BODIES IN THE NASO-PHARYNX

Foreign bodies may rarely become lodged in the naso-pharynx, producing symptoms of post-nasal catarrh with a foetid discharge, nasal obstruction, and sometimes middle ear complications. Paterson has found a spring clip used for regulating an infant's feeding-bottle, and Parker a large piece of drainage tube, in the naso-pharynx. Particles of food may also be lodged there by vomiting, or by coughing in the act of eating.

A Diagnosis can generally be made by posterior rhinoscopy or digital examination.

The Treatment consists in removing the foreign body with a pair of post-nasal forceps. In children a general anaesthetic is necessary. The mouth is held open with a gag, the left forefinger is introduced, and the foreign body located. The forceps are then passed behind the soft palate and guided over the foreign body with the finger, and withdrawn. In adults it may be possible, after cocaineising the soft palate, to guide the forceps over the foreign body with the help of posterior rhinoscopy.

SECTION V

DISEASES OF THE ORO-PHARYNX

CHAPTER XVIII

ACUTE INFLAMMATORY AFFECTIONS

I. ACUTE CATARRHAL PHARYNGITIS: *Etiology, &c.*—*Treatment*, Prophylactic, General, and Local. II. ACUTE INFLAMMATORY AFFECTIONS DUE TO LOCAL INFECTION: A. *Acute Septic Pharyngitis*—(1) Submucous—(2) Superficial—(3) Membranous.—B. *Acute Septic Tonsillitis*—(1) Par-enchymatous—(2) Peritonsillitis—(3) Lacunar—(4) Ulcerative. III. TRAUMATIC PHARYNGITIS. IV. TOXIC PHARYNGITIS.

Acute inflammation of the oro-pharynx may be due to many causes and may from an etiological standpoint be divided into five main groups as under:—

- I. Simple Acute or Catarrhal Pharyngitis.
- II. Acute Inflammations due to General Infections (Chap. iv.).
- III. Acute Inflammations due to Local Infection.
- IV. Acute Traumatic Pharyngitis.
- V. Toxic Pharyngitis.

I. SIMPLE ACUTE OR CATARRHAL PHARYNGITIS

Acute catarrh of the pharynx is most usually but a part of an ordinary cold, but the pharynx may be alone or principally affected.

The *Etiology* is precisely similar to that of ordinary "colds in the head," which has been fully discussed (p. 189), and the *pathological changes* are very similar, except that the three stages are not so well differentiated. At first the soft palate and uvula are vividly red, the redness gradually fading off towards the normal mucous membrane, and later there may be slight swelling and oedema of the uvula and free border of the soft palate, accompanied by increased secretion. Occasionally the uvula may become very oedematous and cause great distress, but this is much commoner in septic varieties of pharyngitis. The

tonsils and posterior wall of the pharynx may share in the redness and swelling in severe cases, but in mild catarrhs they generally escape. As an attack passes off the redness gradually fades, and the swelling subsides. The chief *symptoms* are pain in the throat, aching of the neck, and difficult and painful deglutition, which are aggravated by constant efforts to swallow the increased secretion. Preceding these local symptoms there may be a feeling of malaise with a slight rise of temperature.

The Diagnosis is generally quite simple, but erythema due to secondary syphilis (p. 144), and superficial septic pharyngitis (p. 442), must not be overlooked.

Treatment.—This affection is often so slight that the surgeon is not appealed to for assistance, a demulcent or sedative lozenge or pastil being all that is necessary, but prophylactic measures as well as general and local treatment will be required if the patient is liable to repeated and severe attacks.

Prophylactic Measures have already been fully discussed under acute catarrhal rhinitis (p. 196), and it is only necessary to emphasise here the importance of attention to any chronic inflammatory changes in the nose and the pharynx itself. As long as any chronic rhino-pharyngitis exists, acute attacks are sure to be of common occurrence.

General Treatment may be abortive or curative, the details of which have also been fully discussed under catarrhal rhinitis (Chap. viii.), and nothing further need be added here. By prompt measures catarrh of the pharynx may be arrested and prevented from spreading to neighbouring regions.

Local Treatment will vary according to the stage of inflammation. Broadly speaking, in quite the initial stage astringents are beneficial, and may control or even arrest the catarrh; in the second stage sedatives are indicated; and in the third stage astringents are again useful. Any of these may be applied either as a gargle, paint, or spray, or may be given in the form of a lozenge or pastil. Gargles are suitable only when the soft palate, uvula, or anterior pillars of the fauces are chiefly affected. They probably do not reach the tonsils and posterior wall unless used according to Von Troeltsch's method, which is difficult and painful (p. 56). Lozenges and pastils are objectionable, because they frequently upset the stomach. Both sprays and paints are useful and free from objection.

The advantages and disadvantages of these various methods

of applying local remedies to the pharynx have already been discussed in Chapter ii.

Bearing these points in mind, the following astringents may be mentioned as useful at the very commencement of the initial stage :—

As Gargles.

Garg. Boracis Compositum (p. 58).

Garg. Aluminis et Potassii Chloratis (p. 57).

As Sprays.

Neb. Zinc Chloridi (p. 44).

Neb. Ferri Perchloridi (p. 44).

As Paints.

Pig. Zinc Chloridi (10 gr. to 1 oz.).

Pig. Ferri Perchloridi (60 gr. to 1 oz.).

As Lozenges.

Troch. Krameriae.

Troch. Catechu.

The selected remedy should be used every four hours, and between whiles the patient should suck ice or spray the pharynx with iced water, whilst externally a cold compress is applied to the neck (p. 45). If this treatment has given no marked relief in the course of twelve hours it should be abandoned and sedative treatment adopted.

For the second stage the following soothing applications are beneficial :—

As Gargles.

Garg. Potassii Chloratis (p. 57).

Garg. Boracis (p. 56).

As a Paint.

Pig. Menthol (p. 40).

As Sprays.

Neb. Menthol (p. 44).

Neb. Guaiacol (50 per cent. in almond oil).

As Lozenges.

Troch. Potassii Chloratis.

Troch. Boracis.

As Pastils.

Past. Bismuthi.

Past. Menthol.

Past. Guaiaci.

If the secretions are very tenacious and difficult to void, the *Trochiscus Ammonii Chloridi* (p. 58) or the *Trochiscus Ammonii Chloridi Compositus* (p. 59) is helpful, or the following gargle may be employed :—

R.	Chlorate of Potassium	12 gr. = 0·82 gm.
	Bicarbonate of Potassium	6 gr. = 0·41 gm.
	Bicarbonate of Sodium	6 gr. = 0·41 gm.
	Water	to 1 oz. = 30·0 c.c.

If there is much pain, heat applied externally by means of a boric compress, and internally by means of an inhalation of compound tincture of benzoin, will give relief, in addition to which a pastil of bismuth with morphia or of menthol may occasionally be taken. Lennox Browne states that guaiacol, and to a less degree menthol is especially beneficial as an analgesic, anti-septic, and resolvent.

Occasionally the uvula may attain such a size as to cause great inconvenience to the patient, and to produce hawking, dysphagia, and sometimes irritation of the larynx. Under these circumstances scarification or amputation should be undertaken. In very marked cases the uvula should be removed in the ordinary way (p. 447), but in less marked cases scarification is usually sufficient. Its surface is first painted with a 10 per cent. solution of cocaine, and then two or three deep incisions are made into its substance, after which bleeding and exudation are encouraged by using warmed permanganate of potassium gargle (p. 57).

In the third stage, when the acuteness of the attack has passed off, astringents should be again applied. In addition to the astringents mentioned as useful for the first stage the following may also be used :—

As Gargles or Sprays.

Garg. Aluminis (p. 57).

Garg. Acidi Tannici (p. 57).

As Paints.

Pig. Cupri Sulphatis (p. 40).

Pig. Ferri Sulphatis (p. 40).

As Lozenges.

Troch. Acidi Tannici.

Troch. Cubebæ.

It is well to continue one or other of these local applications till all traces of the inflammation have disappeared.

II. ACUTE INFLAMMATIONS OF THE PHARYNX DUE TO GENERAL INFECTIONS

These have already been dealt with under the Complications of the Upper Respiratory Passages occurring in Acute Specific Fevers (see Chapter iv.).

III. ACUTE AFFECTIONS DUE TO LOCAL INFECTION

There is a wide range of inflammatory affections of the pharynx and tonsils due to local infection, varying from trifling sore throats to the most severe and fatal illnesses. For clinical purposes they may be divided into two groups, namely (1) those involving the whole pharynx, or acute septic pharyngitis, and (2) those chiefly confined to the tonsils, or acute septic tonsillitis. These groups can be further subdivided as follows:—

1. Acute Septic Pharyngitis.
 - (a) Submucous.
 - (b) Superficial.
 - (c) Membranous.
2. Acute Septic Tonsillitis.
 - (a) Acute parenchymatous tonsillitis.
 - (b) Acute peritonsillitis.
 - (c) Acute lacunar tonsillitis.
 - (d) Acute ulcerative tonsillitis.

1. Acute Septic Pharyngitis

Preliminary Remarks.—Semon in 1895 suggested that all the acute septic diseases of the pharynx, larynx, and neck, described as acute œdema of the larynx, œdematous laryngitis, erysipelas of the pharynx and larynx, phlegmon of the pharynx and larynx, and angina Ludovici were not essentially different diseases, but in reality pathologically identical, their differences depending upon the virulence of the poison and the point of its entrance through the mucous membrane. He considered it was impossible to draw any sharp line of distinction between localised and more general infections, and between the œdematous and suppurative forms. Since then, both clinical and pathological evidence has been brought forward to support his suggestion. De Santi has carefully reported four cases of varying degrees of infection of the pharynx, larynx, and neck, in all of which the streptococcus

pyogenes was found. Further, the identity of this organism with Fehleisen's streptococcus erysipelatosus, which is sometimes found in connection with these acute inflammatory affections of the throat, has been demonstrated. Therefore it can now be definitely stated that the majority of instances of these conditions are directly due to the streptococcus pyogenes or some other type of streptococcus, though occasionally they may be caused by other organisms. Acute septic conditions of these regions are extremely likely to spread from one part to another; but the chief pathological changes may in some instances be almost or entirely limited to the pharynx, in others to the larynx, and yet in others to the deep tissues of the neck surrounding the pharynx and larynx or beneath the floor of the mouth. It therefore seems better, though bearing in mind their pathological identity, to describe the septic infections of the pharynx and those of the larynx separately. (For Acute Septic Laryngitis and Perichondritis, see Chapter xxii.)

(a) Acute Septic Submucous Pharyngitis

Definition.—This disease, also called acute phlegmon, gangrenous pharyngitis, or erysipelas of the pharynx, is an acute inflammation of septic origin starting in the submucous tissues, but quickly spreading both superficially and deeply, and occasionally leading to extensive destruction of the parts.

Etiology.—The *exciting cause* is always septic infection, most usually due to the streptococcus pyogenes, though certain staphylococci and other organisms may cause a similar condition.

Predisposing Causes are exposure to cold, chronic alcoholism, and any morbid condition of the nose, teeth, mouth, or pharynx causing abrasion or ulceration of the mucous membrane or leading to chronic suppuration.

Pathological Changes.—The exact pathological changes vary according to the severity of the poisoning and the structure chiefly attacked. In the slighter cases the whole pharynx is swollen and dusky red or almost purple in colour, and has a glistening glazed appearance. The uvula quickly becomes enormously enlarged from inflammatory exudation and oedema; and the tonsils swollen and dark red in colour, whilst their lacunæ fill with a creamy purulent exudation which spreads over their surfaces. In severer cases these changes are still more marked, and large sloughs form on the tonsils or the posterior wall of the pharynx, whilst the uvula may become distinctly gangrenous. The exudation is at

first serous, and later purulent. The disease is not often limited to the pharynx, but spreads downwards to the epiglottis and aryteno-epiglottidean folds, or it extends to the glands and deep tissues of the neck, causing a hard brawny swelling of the affected part.

Symptoms.—The general symptoms are those of profound septic poisoning, usually of an asthenic type. The onset is generally quite sudden, commencing with chills or a distinct rigor and a rise of temperature. The character of the fever varies very much in different cases: in the adynamic cases, which are usually the worst, the temperature generally ranges between 100°.5 and 102° F., but in others it may rise to 106° F., and be accompanied by morning remissions and marked sweating. The pulse is full at first, but later feeble and frequent. The patient soon becomes prostrate, delirious, and finally comatose. Albumen can generally be found in the urine.

Locally the onset is marked by sudden and severe pain in the throat and dysphagia, quite out of proportion to the changes which can be seen. As the parts swell the voice becomes nasal, swallowing is almost impossible, and some dyspnœa may occur, whilst, if sloughing takes place, the breath becomes horribly foetid. If the disease spreads to the larynx fresh symptoms, and especially severe dyspnœa, will supervene (p. 495). If the glands and deep tissues of the neck become involved, there will be pain, greatly aggravated by any movement, and stiff neck.

Diagnosis.—In marked cases the general condition of the patient and the clinical appearances of the affected parts usually place the diagnosis beyond doubt. It is essential to remember that streptococcal infection of the pharynx and larynx may occur in the course of scarlet fever, diphtheria, and other acute specific fevers, and may mask the original infection by producing the signs and symptoms just enumerated.

Prognosis.—In severe cases the prognosis is always grave. Death may occur from the virulence of the septic poisoning, or from suffocation due to oedema of the larynx.

Treatment.—Both general and local treatment must be promptly adopted. The **general treatment** is very important, and must be carried out on exactly the same lines as suggested under acute septic laryngitis (p. 496). A bacteriological examination of the secretion should always be made directly the patient comes under observation, and if the streptococcus pyogenes is found,

anti-streptococcal serum, in doses of from 10 to 20 c.c., should at once be injected. Three cases recorded by De Santi, in which this was done, all made good recoveries, even though one case was of a most severe type.

Local Treatment.—If the case is seen and recognised quite at the commencement, the pharynx should be painted once with a strong disinfectant such as the Pigmentum Hydrargyri Perchloridi (p. 40), and cold applications tried. Small pieces of ice should be constantly sucked, and a cold compress or Leiter's tubes (p. 45) applied to the neck. If this fails to arrest the inflammatory process in the course of a few hours and the condition is getting worse, warm applications should be substituted for cold, as the latter may increase the risk of gangrenous sloughing. Hot compresses or hot Leiter's tubes should be placed on the neck, and the throat swabbed with warm antiseptic gargles, such as perchloride of mercury (1 in 2000), Garg. Pot. Permang. (p. 57), or Resorcin (20 gr. to 1 oz.), and between whiles the patient should frequently use the Vapor Creosoti (p. 53). If deglutition is very painful a 5 per cent. solution of cocaine may be applied before nourishment is taken, and if swallowing becomes impossible owing to swelling, rectal feeding will have to be adopted. If the case is far advanced, the prostrate condition of the patient may render local treatment very difficult and even unadvisable, but, if possible, the pharynx should be kept clean by swabbing it out or by syringing it with a saturated solution of borax, or with a solution of peroxide of hydrogen (20 vols.), and if sloughs form they must be removed as soon as possible. De Santi recommends that the gangrenous part should at once be thoroughly rubbed with pure carbolic acid.

(b) Acute Septic Superficial Pharyngitis

This condition will be described more fully as it affects the larynx, the description in most particulars being equally applicable to the pharynx. It is due to a slight septic poisoning, and is characterised by a general injection of the pharynx giving the mucous membrane a darkish-red colour, and by slight swelling of the tonsils and uvula. The posterior wall is more frequently and distinctly involved than is the case in catarrh, and, moreover, the general depression of health is more marked, whilst the inflammation is more persistent. The symptoms are otherwise much the same.

Treatment.—The same *general* treatment which is recommended for a similar laryngitis must be promptly adopted (p. 493). *Locally*, if the disease is seen and recognised quite early, the pharynx should be brushed over once by the surgeon with a strong solution of perchloride of mercury (1 in 100, p. 40) in the hope of arresting the attack. If not seen till the second or third day, milder antiseptics should be used as gargles or paints, such as Garg. Potassii Permanganatis (p. 57), Garg. Sanitas (30 m. to 1 oz.), Pig. Boro-glyceride (p. 55), or Pig. Resorcin (p. 40). When the acute stage has passed astringents, such as the Pig. Ferri Perchloridi or Troch. Krameriae, are useful.

(c) Membranous Pharyngitis

Definition.—An acute inflammation of the pharynx characterised by the formation of a false membrane.

Etiology.—The formation of a membrane on the mucous membrane of the pharynx is the result of some intensely irritating poison, and the greater the irritant, the greater will be the density and tenacity of the membrane. Many micro-organisms may cause a membranous inflammation, but the commonest, and generally the most virulent, is the Klebs-Loeffler bacillus (p. 92). Injury caused by steam, boiling water, or corrosive fluids may also result in the formation of a false membrane.

Pathological Changes.—The mucous membrane is red and swollen ; its surface is partly covered by a tough white or yellow membrane, which cannot be removed without abrading the underlying surface. The commonest site is the tonsil, but the membrane frequently spreads on to the soft palate and uvula, and less commonly to the posterior wall of the pharynx. The larynx may also be involved.

Symptoms.—The local symptoms vary in degree with the severity of infection. In rare instances they may amount to little more than discomfort, but more usually distressing pain and dysphagia are complained of. The general symptoms vary in the same way. They may be little more than those of slight malaise, or they may be those of severe septic poisoning.

Diagnosis.—All forms of membranous pharyngitis, except the traumatic, are contagious ; but those due to the diphtheria bacillus are very much more so than those due to streptococci or other varieties of micro-organisms. An exact diagnosis is therefore of importance from the point of view of public health, for diphtheria

should be strictly isolated. It is generally possible to recognise diphtheria from the clinical aspect of the case, but sometimes it is difficult to distinguish a mild attack from simple follicular tonsillitis, and a more severe one from streptococcal infection. In all suspicious cases the secretions should at once be microscopically examined and cultures made to determine the exact nature of the micro-organism.

Treatment.—The treatment will depend to a great extent on the nature of the infection. An early and exact diagnosis is most important, for if the case is one of diphtheria the sooner anti-diphtheritic serum is injected the better are the chances of saving life and preventing subsequent paralysis (p. 94). If, on the other hand, the case is one of streptococcal infection, the early injection of anti-streptococcal serum may in some instances arrest the disease and prevent serious complications, such as extension of the disease to the larynx. Other indications for treatment, both general and local, are described under diphtheria (p. 94) and membranous laryngitis (Chapter xxii.).

2. Acute Septic Tonsillitis

Clinically four main varieties of acute tonsillitis may be distinguished, namely :—

- (a) Acute Parenchymatous Tonsillitis.
- (b) Acute Peritonsillitis.
- (c) Acute Lacunar Tonsillitis.
- (d) Acute Ulcerative Tonsillitis.

Etiologically and pathologically, however, these cannot be considered as four distinct diseases, nor can they be definitely separated from the forms of acute septic pharyngitis which have just been discussed. They are all due to infection with micro-organisms, though there is no one organism peculiar to, or invariably associated with, each group of pathological changes. The variety and severity of the tonsillitis depend entirely upon the exact variety and virulence of the micro-organism, and upon the region and the tissues chiefly affected. The remarks quoted from Semon and De Santi (p. 419) on the pathological identity of the different forms of acute septic infections of the upper respiratory passages may be extended to the different forms of acute tonsillitis. These four forms of acute tonsillitis are only mentioned separately because they have distinct clinical features.

Etiology.—In all four forms of septic tonsillitis the etiological factors are the same, and may be considered under the heads of exciting and predisposing causes.

The one and only exciting cause is infection with septic micro-organisms. Several varieties have been found, of which the most important and that which produces the most serious clinical conditions is the streptococcus pyogenes, but staphylococci and pneumococci are also common. In some cases pure cultures of one of these organisms can be obtained, but much more often there is mixed infection.

Predisposing Causes.—Speaking broadly any conditions leading to depressed general health or to diminished local resistance may be considered as predisposing causes. Thus tonsillitis is common amongst people in ill-health, especially when this is due to overwork or insanitary surroundings. It is also common in people suffering from any form of chronic tonsillitis, but commonest of all when depressed general health, chronic tonsillitis, and exposure to septic influences are combined. Apart from these broad etiological principles acute tonsillitis may be secondary to chronic septic conditions of the nose, mouth, or teeth; it most frequently occurs between the ages of fifteen and thirty; it is commoner in spring and autumn than at other periods of the year, though outbreaks of it may occur in hot, dry, and dusty weather; it is mildly infectious from one person to another; it sometimes occurs in almost epidemic form, the contagion being probably carried by milk, and one attack predisposes the patient to others. Chills and exposure to wet or cold are certainly powerful etiological factors, and often seem to be the immediate cause of an attack. They act, however, by lowering the patient's vitality and resisting power, thus allowing the micro-organism to obtain a foothold.

Pathological Changes.—The pathological changes of the various forms of acute tonsillitis must be separately described.

(a) **Acute Parenchymatous Tonsillitis.**—This may be unilateral or bilateral, but it generally starts on one side, the other tonsil becoming involved after an interval of twenty-four or forty-eight hours. At the onset there is intense redness and some swelling of the affected tonsil, accompanied by more or less injection of the whole pharynx. The swelling gradually increases, and the tonsil projects inwards beyond the pillars of the fauces and sometimes attains the size of a large walnut. As a rule the inflammation gradually subsides and the swelling decreases. The tonsil

itself, however, is generally left permanently enlarged. Occasionally an abscess may form in the substance of the tonsil, the surface of which will then lose its honeycombed appearance and become smooth, red, and rounded.

(b) **Acute Peritonsillitis.**—In this affection the cellular tissue around the tonsil is chiefly affected, though as a rule there is also some true tonsillitis. It is at first unilateral, but the opposite tonsil often becomes affected just as the original one is getting well. At the onset the changes resemble those of parenchymatous tonsillitis, but as the disease advances there is swelling of the

affected side of the pharynx extending across the middle line. The uvula becomes oedematous, and the soft palate looks tense, red, and shiny, and bulges forward and downward into the mouth (Fig. 192). The movements of the lower jaw are limited, the mouth is opened with difficulty, the tongue is furred and indented, and the pharynx filled with sticky saliva, which the patient can neither swallow nor spit out. The inflammation may subside without suppuration, but as a rule, unless the

attack is arrested at the outset, an abscess forms and points in the soft palate midway between the middle line and the anterior pillar of the fauces. If the abscess burst, the ragged edges of the opening can sometimes be seen with pus escaping from the cavity. Not infrequently it bursts through the supra-tonsillar fossa, and occasionally behind or below the tonsil. Lastly, the cervical glands are nearly always considerably enlarged, and often surrounded by inflammatory thickening.

(c) **Acute Lacunar Tonsillitis.**—This is usually bilateral and commences with signs of a general pharyngitis, swelling of the tonsils, and slight oedema of the uvula and free border of the soft palate. The lacunæ are the structures chiefly affected. They are sometimes filled with epithelial débris and leucocytes together with micro-organisms, in which case their openings become blocked and the surface of the tonsil is studded with yellow elevated spots of variable size. In other instances the lacunæ secrete a thick

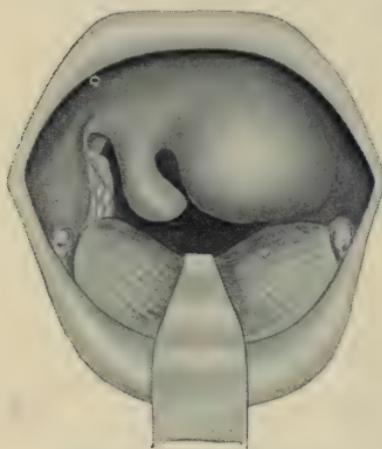


FIG. 192.—Acute peritonsillitis.

tenacious muco-purulent secretion which escapes from the openings and spreads itself in patches over the tonsil so as to give rise to the appearance of a false membrane.

(d) **Acute Ulcerative Tonsillitis.**—This rare form of acute septic tonsillitis is characterised by the formation of one or more distinct ulcers on the surface of the tonsil. Each ulcer is more or less round or oval, from a threepenny to a sixpenny bit in size, and covered by a greyish yellow secretion or slough. There is not much swelling of the tonsil, and signs of active inflammation are not always present, though in the majority of cases the ulcer is surrounded by a very hyperæmic areola, and the whole pharynx is much congested.

A special form of ulcerative tonsillitis, known as Vincent's angina, must be mentioned. It is associated with special fusiform bacilli and spirilla, and is characterised by the formation of greyish white pseudo-membranous deposits on a depressed surface, looking very like diphtheria. One or both tonsils may be affected, and occasionally the soft palate and uvula also. The membranous exudation is soft though tenacious; it can easily be peeled off, but leaves a raw bleeding surface, and quickly re-forms. In the later stages distinct ulceration occurs under the exudation. The ulcer is depressed and its edges are red and sometimes oedematous. Vincent's angina is further characterised by the absence of all general symptoms and by the chronicity of its course. In some instances staphylococcal infection of the ulcer may occur, in which case the characteristics of Vincent's angina are masked by the superadded infection.

Symptoms.—Both general and local symptoms are much the same in all forms of tonsillitis, varying in degree with the severity of the infection, and being as a rule most marked in the *peritonsillar* form. The general symptoms are ushered in by a feeling of malaise and chill, or even a distinct rigor. The temperature usually runs up quickly to between 102° and 104° F., and the pulse is rapid, full, and bounding. Occasionally the fever assumes a more asthenic type, the temperature not exceeding 101° F., whilst the tongue is dry, brown, and coated, and the pulse frequent and feeble. Sometimes there may be an erythematous rash suggestive of scarlet fever, which may be followed by a powdery desquamation, but not a real peeling. Lastly, it is very common for the patient to complain of pains in the joints. *Locally*, the onset is marked by sudden pain in the throat and some dysphagia. In bad cases these symptoms increase in severity until swallowing becomes almost

impossible and even fluids are taken with great difficulty. In cases of *peritonsillitis* the dysphagia is especially marked, the jaws become partially fixed, the head is kept protruded forward and rigid, and the voice is weak and smothered. The breath becomes very offensive, and a collection of ropy mucus and saliva in the pharynx causes great distress, whilst earache, and occasionally slight dyspnoea, may add to the patient's discomfort. Finally from the third to the fifth day the pain reaches its height and becomes throbbing in character, which generally indicates that suppuration has occurred. The patient becomes worn-out and exhausted, and all the symptoms gradually increase in severity until the abscess bursts, or is opened, when sudden and often complete relief is obtained. Unfortunately for the patient, just after this has occurred the other tonsil often starts the same process, and all the pain and discomfort has to be borne a second time.

Diagnosis.—Typical cases of all four varieties can hardly be mistaken for one another or for any other disease. In the acute lacunar form with a secretion on the surface of the tonsil, and in Vincent's angina, diphtheria must be excluded (p. 92). It must also be remembered that some of the acute infectious fevers, and especially scarlet fever, often commence with acute tonsillitis resembling the early stages of the parenchymatous form. Finally slight cases of parenchymatous tonsillitis must be carefully distinguished from erythema and swelling of the tonsil due to secondary syphilis (p. 144).

Prognosis.—In uncomplicated cases of all forms of acute septic tonsillitis the prognosis is good. They generally run their course in from four to twelve days. Treatment as a rule curtails the duration of the attack.

Complications.—Though the prognosis is as a rule good, certain complications and sequelæ may occur which add to the gravity of the patient's condition or even endanger life. The following may be mentioned : (1) Bursting of a peritonsillar abscess during sleep, causing immediate suffocation or subsequent infection of the lungs. (2) Spreading of the inflammation to some large vessel of the neck, followed by dangerous and sometimes fatal haemorrhage. (3) Acute suppurative otitis media, sometimes followed by acute mastoiditis. (4) Escape of pus into the neck, or even into the mediastinum so as to cause a deep-seated abscess. (5) Infective phlebitis, peritonitis, orchitis, ovaritis, and general septicæmia. (6) Chronic abscess of the tonsil.

In addition to these there are two other complications requiring special mention, namely, paralysis of the palate and so-called acute rheumatism. If paralysis occur, the strong probability is in favour of an error of diagnosis, the case having been one of diphtheria from the outset. A swab should at once be taken from the throat and the secretion carefully examined for the diphtheria bacillus. This will generally be found, and then the patient must be treated in accordance with the altered diagnosis (p. 94). Even if it is not found, the diagnosis cannot be considered entirely settled, and it is advisable to keep the patient under close observation in case other paralyses or cardiac weakness should develop. Even in typical cases of peritonsillitis with definite abscess formation, co-existing diphtheria cannot be entirely excluded, though such a mixed infection is very rare. During and immediately after peritonsillitis return of fluid through the nose may take place, and the patient may speak in the manner typical of paralysis of the palate, but this is not a true paralysis. It is due to the infiltration of the palatal muscles with inflammatory products, and occurs most frequently when both sides of the pharynx have been affected. In short it may be said that symptoms simulating paralysis of the palate may occur during and immediately after an attack of acute septic inflammation of the tonsils and peritonsillar tissues, but that when a true paralysis occurs after a distinct interval from the disappearance of the throat symptoms, it is invariably due to diphtheria.

As regards so-called acute rheumatic fever complicating acute tonsillitis, a few points may be suggested for consideration. There is no doubt whatever that all forms of acute tonsillitis, but especially the suppurative forms, may be followed by acute arthritis simulating acute rheumatism, and in some instances by acute endocarditis and pericarditis. It is, however, a very open question whether these complications, following acute tonsillitis, bear any relation from an etiological standpoint to similar conditions occurring in acute rheumatism. There are a great many diseases, in addition to the four varieties of acute tonsillitis, which may be followed by acute inflammatory troubles of the joints and to a less extent of the heart, such as scarlet fever, German measles, influenza, typhoid fever, pneumonia, syphilis, and gonorrhœa. In some of these the micro-organism peculiar to the disease has been found in the joint. This is so in gonorrhœa; and consequently the arthritis, which used to be spoken of as gonorrhœal rheumatism, is now known to be

due to the presence of the gonococcus in the affected joint. Again in the arthritis complicating typhoid fever, the bacillus typhosus has been found. Further, in cases of ulcerative endocarditis following influenza, the bacillus influenzae has been found in the blood during life and in the vegetations about the valves after death; the pneumococcus has been found in cases complicating pneumonia, and the streptococcus in cases of streptococcal infection. It therefore seems very much more scientific and precise to assume, pending definite knowledge, that in all the other diseases mentioned above the inflammation of the joint and the cardiac complications are due to the presence of the micro-organism peculiar to each disease or to their toxins. Such complications following septic tonsillitis should, therefore, be spoken of as septic arthritis, septic endocarditis, and septic pericarditis, rather than acute rheumatism. In the same way it even seems reasonable to suggest that in idiopathic acute rheumatism (if the term "idiopathic" is allowable) the cardiac and joint symptoms are not primary, but that the whole train of symptoms are secondary to some local infection, from which the micro-organism or its toxins are conveyed by the blood stream to the joints and heart. The site of local infection is most probably the throat, for in some 75 per cent. of cases of acute rheumatic fever, a definite history of sore throat preceding the more general symptoms can be obtained. In the remaining 25 per cent. it is not at all improbable that the poison gains entrance through the throat, though there is no sufficient local reaction set up to call attention to it clinically.

Treatment.—Both local and general treatment are necessary in all varieties of acute septic tonsillitis, and after the attack prophylactic measures should be undertaken to prevent future infections, which are always likely to occur. Parenchymatous tonsillitis and peritonsillitis require rather different treatment from the more superficial forms, and will therefore be separately described.

(1) **Treatment of Parenchymatous Tonsillitis and Peritonsillitis.**—(a) **General.**—At the onset of an attack a purgative dose of calomel (3 to 8 gr.) must be given, followed in six hours' time by a saline draught, such as a Seidlitz powder or an ounce and a half of white mixture (p. 59). The patient should be put to bed in a warm well-ventilated room and fed every two hours with liquids or semi-solids of a nourishing nature. The best drug for internal administration is undoubtedly tincture of perchloride of iron. It should be given in doses of 20 or 30 drops four times

a day, as recommended for other septic conditions of the upper respiratory tract (p. 59). The sooner it is commenced the more hope there is of cutting short the disease and of preventing suppuration. Salicylic acid or one of its salts, especially salicylate of quinine, has also been strongly recommended and found useful. It was undoubtedly introduced on the wrong assumption that tonsillitis is rheumatic in origin, but its usefulness is really due to the fact that it is beneficial in all septic infections. Watson Williams recommends the following formula, to which he adds some salicylate of bismuth if the tongue is very much coated :—

R.	Salicylate of soda	12 gr. = 0.82 gm.
	Salicylate of quinine	4 gr. = 0.27 gm.
	Mucilage of tragacanth	q.s.
	Peppermint water	1 oz. = 30 c.c.

Perchloride of iron and salicylate of soda may be given together, and the combination occasionally seems to have some influence in arresting the attack. They are used in the following manner :—

R.	A. Tincture of perchloride of iron	3 dr. = 11.25 c.c.
	Glycerin	1 dr. = 3.75 c.c.
	Water	3 oz. = 90 c.c.
B.	Salicylate of soda	1 dr. = 3.75 c.c.
	Carbonate of ammonium	30 gr. = 2.06 gm.
	Water	3 oz. = 90 c.c.

Mix A and B slowly together, and give one ounce of the mixture four times a day.

Mackenzie very strongly recommended guaiacum in the form of a lozenge, powder, or the ammoniated tincture, and maintained that it seldom failed to cut short an attack of deep tonsillitis if given at the outset. Salol in 15 gr. doses given four times a day has also been strongly recommended. Of the more recent drugs, aspirin may be mentioned ; it not only seems to check the onward course of the disease, but often acts as a charm in affording relief from pain. Though all these drugs are sometimes useful in certain cases, they do not deserve the credit which has been given to them as abortives, and failing any special indications perchloride of iron should be administered as the routine treatment. If arrest and resolution of the inflammation takes place without suppuration, it is much more likely to be due to the mildness of the infection than to the exhibition of any particular drug ; and, on the contrary, if the micro-organism is of sufficient virulence,

suppuration will occur whatever drug is given. "The morbid action marches onwards, unchecked in its course, until the formation and discharge of pus announces the completion of the process" (Trousseau, quoted by Mackenzie).

(2) **Local Treatment.**—Various local measures have been suggested with the hope of arresting the inflammatory process, but their efficacy is very doubtful. As just stated the course of the attack depends on the severity of the infection. Local measures should nevertheless be tried. In the very early stages painting the throat with either a strong antiseptic or an astringent, combined with cold applications to the neck (p. 45) and the constant sucking of ice, should be tried. As antiseptics the Pig. Hydrargyri Perchloridi (p. 40) may be applied once, and then glycerin of carbolic (1 to 20) or Pig. Resorcin (p. 40) every four hours. As an astringent a solution of nitrate of silver (10 to 20 gr. to the ounce) is the most likely to be efficacious. A saturated solution of bicarbonate of soda freely applied to the affected side on a sponge, and used as hot as the patient can tolerate, has sometimes seemed to check the inflammation and may be given a trial.

If after twenty-four or forty-eight hours of such treatment the tonsillitis is still actively advancing, abortive remedies should be abandoned and palliative measures substituted. Instead of cold to the neck and ice to the pharynx, warm boric poultices should be applied externally, and the pharynx soothed by steam inhalations of compound tincture of benzoin (p. 52). Gargles are not of very much service as they do not easily reach the tonsils and their use often occasions considerable pain, so that local applications should be made by means of a tampon of cotton wool on a carrier, or by means of sprays. Both antiseptic and soothing applications are required. As antiseptics the Nebula Potassii Permanganatis (p. 50), the Nebula Alkalina (p. 31), the Collunarium Boro-glyceride or Collunarium Sanitas (p. 29) are useful. The Nebula Alkalina is especially indicated when tenacious secretions are present. Watson Williams strongly recommends painting the pharynx and syringing out the supra-tonsillar fossa with a solution of protargol (2 to 4 per cent.). As soothing applications menthol (10 gr. to the ounce of paroleine), or cocaine, 5 per cent., or both combined (p. 44) may be mentioned. They should be applied about ten minutes before nourishment is taken, so as to allay the pain of swallowing. If menthol alone is used, it may be applied with a spray producer, but any preparation containing cocaine is

best applied with a brush or cotton wool swab. A 20 per cent. solution of cocaine has been recommended as a paint, not only with the object of allaying pain, but of depleting the inflamed area and so possibly of aborting the attack. It is stronger than necessary for allaying the pain and the reaction which follows its application is harmful, therefore the weaker solutions are better. Painful deglutition may be helped by the patient placing the palms of his hands firmly over the ears, and, at the moment of swallowing, raising the auricles (Hovell). This is often of real service in enabling the patient to take nourishment.

If an abscess form, *operative measures* will save the patient many hours if not days of suffering. In the first place a few words may be said about scarification as a method of treatment. It has been advised that one or two superficial incisions should be made over the inflamed area with a view to relieving tension and depleting the part. This cannot be recommended, as it does not prevent deep-seated suppuration, and adds considerably to the pain and difficulty of swallowing, whereas, if pus is already present, nothing short of evacuating it can give the patient any relief. Directly the throbbing character of the pain and the bulging forwards of the soft palate suggest the presence of pus, the abscess should be opened through the soft palate. This may be done by means of a pair of Lister's sinus forceps, or with a pharyngeal bistoury. The former is the more expeditious, the less painful, and the safer method. It has been practised at the Throat Hospital as the routine method for the last fourteen years, and has given very satisfactory results. It is thus carried out: The mouth is opened as far as possible, the pharynx illuminated by means of a reflected light, the tongue gently depressed, and a 10 per cent. solution of cocaine applied. After five minutes' interval a pair of Lister's sinus forceps, previously sterilised, are forced by means of a sharp thrust through the most prominent part of the bulging palate into the abscess cavity. The blades are then opened widely in a vertical direction and withdrawn, thus making a vertical tear in the soft tissues. If the abscess is near the surface the exact spot through which the forceps ought to be thrust is often marked by a yellow discolouration; but supposing there is no such indication, a point a little to the outer side of the centre of an imaginary line drawn from the base of the uvula to the upper wisdom tooth should be selected. It may be necessary to plunge in the forceps

to a depth of half an inch from the surface before the pus is reached.

The abscess can also be opened with a pharyngeal bistoury or a fine scalpel under local anæsthesia as follows: a really good illumination of the region having been secured, the bistoury is inserted into the abscess at the spot already indicated for plunging in the forceps, and an incision half an inch in length is made in an inward and slightly upward direction. If the incision is commenced at this spot and carried *inwards* there is practically no risk of wounding any important vessel. This opening is enlarged by means of a pair of ordinary dressing forceps.

Moure has suggested opening the abscess by burning through the superimposed tissues with the galvano-cautery as a safe and efficacious method, and it has also been proposed that the abscess may be reached with a blunt probe through the supra-tonsillar fossa; but the sinus forceps is the quickest, safest, and least painful method.

The after-treatment consists in encouraging the flow of blood and pus by the frequent use of a hot lotion of permanganate of potassium. If a knife has been used it is advisable on the following day to separate the edges of the incision, which often adhere together with astonishing rapidity, so as to make sure there is no retained pus. If there is pus, this should be repeated each succeeding day until none is found. When forceps are used, the edges of the wound are not likely to adhere with such rapidity, and probing is generally unnecessary. Tonics and change of air are always advisable during convalescence.

2. Treatment of Lacunar and Ulcerative Tonsillitis.—

(a) **General.**—The severity of these forms of tonsillitis varies very much in degree, and the general treatment will consequently vary with the severity of the general symptoms. If there is a rise of temperature the patient should be confined to bed, and a light nutritious diet given. The bowels must be freely opened by a brisk purge and then large doses of perchloride of iron (p. 59) commenced. This is the most useful drug, but in some instances salicylate of soda either alone or combined with perchloride of iron (p. 431) may be tried.

(b) **Local.**—In the early stages the application of solid nitrate of silver fused on a probe (p. 36) is beneficial. In lacunar tonsillitis it is applied to two or three crypts at a time. In ulcerative tonsillitis the surface of the ulcer should be carefully cleaned before

the application is made. Later antiseptic paints should be used, of which resorcin (p. 40) and permanganate of potassium are the most beneficial. When the attack is subsiding astringents may hasten recovery, and may help to reduce the size of the tonsil. Perchloride of iron and glycerin of tannin used as paints are both helpful, or krameria lozenges may be given.

In young children with lacunar inflammation, the tonsillar enlargement may be so great as to cause embarrassing dyspnoea and complete inability to take nourishment. Under these circumstances it is advisable to remove at any rate one tonsil, but under no other circumstances should amputation of the tonsils be undertaken whilst they are acutely inflamed.

Prophylactic Measures.—It must be remembered that an attack of acute septic tonsillitis does not protect the patient against future attacks, but, on the contrary, seems to predispose him to them. Many patients have an annual or even half-yearly attack, generally occurring in the spring or autumn, or both. It is therefore very important to see if any of the causes predisposing to infection (p. 425) are present, and if possible to remove them. To this end the nose should be carefully examined for signs of chronic suppurative conditions, the mouth and teeth searched for any diseases likely to be a source of infection, and above all the condition of the tonsils themselves should be taken into careful consideration. If they are enlarged, ragged or unhealthy, or if the mouths of the crypts are apt to become blocked with secretions, these conditions should be treated in the manner described in the next chapter. Again, it should be remembered that the exciting cause of tonsillitis is always microbial infection, and the predisposing cause is often enfeebled health induced by insanitary surroundings. It is therefore of the utmost importance to investigate the sanitary condition of the dwelling with its surroundings and that of the office to which the patient may go to work. Finally, seeing that an attack is often induced by lowered vitality due to exposure to wet and cold, many of the measures advocated for the prevention of acute catarrh (p. 196) are also useful prophylactic measures in acute tonsillitis.

IV. TRAUMATIC PHARYNGITIS

Definition.—An acute pharyngitis caused by any form of injury, sometimes resulting in cedematous inflammation and sometimes in superficial or deep suppuration.

Etiology.—Injury to the pharyngeal mucous membrane may be caused in a great variety of ways. It may be due to scalding from drinking boiling water—a common cause in children—or to the inhalation of flame, steam, or super-heated air. It is often caused by swallowing corrosive liquids, such as carbolic or one of the mineral acids. Again, it may result from abrasions of the pharynx due to swallowing hard substances, or to impaction of foreign bodies, such as pins, fish bones, splinters of wood or glass, on the walls of the pharynx or in the tonsils. Finally, it may result from injuries due to pipe stems, pencils, or umbrellas, &c., being driven backwards into the pharynx through the mouth.

Pathological Changes.—The pathological changes will vary with the cause and severity of the injury. Boiling water, steam, super-heated air or flame will cause a most intense general pharyngitis, often quickly followed by inflammatory oedema of both pharynx and larynx. Corrosive fluids cause according to their nature either discolouration, hardening, and shrinking of the mucous membrane, or inflammation, softening, and detachment. These changes, whatever the immediate cause, may be followed by extensive superficial suppuration, gangrenous sloughing, or the formation of a membrane. The larynx and oesophagus are generally also involved, and deep-seated suppuration of the neck may occur. When the injury is due to wounds, the inflammatory process is generally more localised, and healing may take place readily, or the wound may become septic. If foreign bodies become impacted they may lead to deep-seated suppuration, giving rise to an abscess in the tonsils or in the posterior pharyngeal wall (traumatic retro-pharyngeal abscess). This latter is marked by a red, soft, fluctuating swelling, usually situated in the oro-pharynx, but occasionally nearer the larynx.

Symptoms.—When due to burns or scalds or to corrosive fluids, the symptoms in slight cases will be those of a simple acute pharyngitis (p. 416), and in severe cases those of acute phlegmonous pharyngitis or membranous (pp. 420 and 423). The oesophageal and laryngeal complications are generally of more importance than the pharyngeal condition, severe pain, extreme dysphagia, and urgent dyspnoea generally being present. When the pharyngitis is due to corrosive liquids there are often symptoms of general poisoning.

When the pharynx is wounded by foreign bodies, there will be pain and aching increased by swallowing, and if the wound becomes infected with septic organisms, there will be rise of

temperature and general malaise, and the symptoms of septic pharyngitis. If an abscess result, there will be increased pain, often of a throbbing character, with dysphagia, and the symptoms will be similar to those of tonsillar or peritonsillar abscess. In acute traumatic retro-pharyngeal abscess the severity of the symptoms and the activity of the inflammation are greatly in excess of those due to a tuberculous abscess (p. 138).

Prognosis.—This entirely depends on the cause and severity of the injury. In mild or purely localised cases the prognosis is good, but in severe cases, and especially those due to burns, scalds, or the swallowing of corrosive liquids, the resulting septic infection of the pharynx may prove fatal, or death may result from oedema of the larynx.

Diagnosis.—The history of the case generally makes the diagnosis clear. It is necessary to distinguish traumatic retro-pharyngeal abscess accurately from tuberculous cases, as in some cases the treatment differs considerably.

Treatment.—This must be carried out on general principles according to the condition caused by the injury. Mild general pharyngitis due to slight injuries must be treated as a simple acute pharyngitis (p. 416). At first soothing applications must be used, followed by astringents if necessary. Severer injuries causing destruction of the mucous membrane should at first be treated by soothing steam inhalations, such as the vapour of tincture of benzoin, and by mildly antiseptic washes, such as boro-glyceride, used as a spray. If there is excessive pain, morphia should be blown on to the affected area. Later, when the mucous membrane has separated, the resulting granulating surface may be encouraged to heal by the application of astringents, such as solutions of nitrate of silver or chloride of zinc.

Where the injury is followed by excessive oedema, sloughs, or gangrene, the case must be treated on the lines already suggested for acute septic submucous pharyngitis (p. 421), and when the larynx is implicated so as to cause dyspnoea, an early tracheotomy should be performed, if necessary, and other measures recommended for septic laryngitis (p. 496) must be carried out.

A simple wound of the pharynx, whether caused by the swallowing of a foreign body or by an injury through the mouth, must be kept thoroughly clean by means of antiseptic lotions used either as a gargle, spray, or paint, according to the position of the wound. The lotion should be applied frequently, and always after food has

been taken. If the wound becomes septic, it must be treated as recommended for septic pharyngitis.

A traumatic tonsillar abscess should be opened without delay under local anaesthesia. A good light is reflected into the pharynx, and a free opening is made into the tonsil by means of sinus forceps (p. 433) or a curved pharyngeal bistoury. Directly the abscess is opened the head should be bent forwards and the pus expectorated, and the mouth afterwards washed with a weak solution of Condy's fluid.

Traumatic retro-pharyngeal abscess should also be opened without delay. The method to be employed will vary with the size of the abscess and with the age of the patient. In young children, in whom a general anaesthetic is always necessary, the external method recommended for opening and draining a chronic tuberculous abscess (p. 139) should be employed, if the abscess contains any considerable amount of pus. If it were opened through the mouth there would be the risk of the pus running into the larynx causing suffocation, or into the lungs causing septic pneumonia. If the abscess is small it may be opened through the mouth in the manner described for a tuberculous abscess (p. 141). In adults in whom the operation can be performed without a general anaesthetic both big and small abscesses may be opened through the mouth. Under local anaesthesia there is no risk of suffocation or septic pneumonia, and an adult patient can expectorate the pus which afterwards oozes from the abscess cavity.

V. TOXIC PHARYNGITIS

Definition.—Inflammatory conditions of the mucous membrane of the pharynx caused by drugs taken internally.

Etiology.—The following drugs may cause inflammatory changes in the pharynx :—mercury, antimony, iodide of potassium, arsenic, copper, lead, zinc, and belladonna.

Pathological Changes, Symptoms, and Treatment.—
(1) *Mercury.*—Impregnation of the system with mercury, either administered as a medicine, or absorbed during work in a quicksilver mine or as a gilder, may lead to general inflammation of the pharynx characterised by redness of the mucous membrane, and grey-coloured ulcers. The tongue, mouth, and gums are as a rule simultaneously affected, and salivation is present. The chief symptom complained of is dysphagia. The treatment consists in

removing the cause, in syringing the throat with peroxide of hydrogen, and in the internal administration of chlorate of potassium, iodide of potassium, or belladonna.

(2) *Antimony*.—Tartrate of antimony in full doses quickly produces redness, swelling, and ulceration of the pharynx, accompanied by a feeling of heat and tension in the throat combined with dysphagia. The administration of the drug should be discontinued, and astringent applications, such as alum or sulphate of zinc, should be made.

(3) *Iodide of Potassium*.—Small doses of this drug may produce redness and edematous swelling of the mucous membrane of the pharynx, as they may also in the nose and larynx. If the pharynx is affected there is general redness combined with a feeling of tenseness and dryness. The treatment consists in leaving off the drug, or in increasing the dose to 20 or 30 grains three times a day, and in administering a morning dose of sulphate of magnesium. Other preparations of iodine may cause similar troubles.

(4) *Arsenic, Copper, Lead, and Zinc* in any form may cause inflammation of the pharyngeal mucous membrane.

(5) *Belladonna*.—Full doses of this drug may cause redness and dryness of the mucous membrane of the pharynx combined with pain and dysphagia. The other physiological effects of the drug accompany these symptoms. Emollient and sedative gargles (p. 56) are indicated, and the drug should be suspended for a time and then given in smaller doses.

CHAPTER XIX

CHRONIC INFLAMMATORY AFFECTIONS

I. CHRONIC HYPERPLASTIC PHARYNGITIS: General Etiology and Treatment.
—A. *General Chronic Pharyngitis*—Local Treatment.—B. *Granular Pharyngitis*—Local Treatment.—C. *Pharyngitis Hyperplastica Lateralis*—Local Treatment.—D. *Elongated Uvula*—Treatment. II. CHRONIC TONSILLITIS: A. *Chronic Hyperplastic Tonsillitis*—Etiology, &c.—Treatment—Methods of Removal of Tonsil, Cauterisation, &c.—B. *Chronic Lacunar Tonsillitis*—Etiology, &c.—Treatment.—C. *Diseases of the Lingual Tonsil*. III. PHARYNGITIS SICCA—*Simple*—*Festid*.

CHRONIC inflammatory affections may be divided into three main groups, namely :—

- I. Chronic Hyperplastic Pharyngitis.
- II. Chronic Tonsillitis.
- III. Chronic Dry Pharyngitis.

I. CHRONIC HYPERPLASTIC PHARYNGITIS

The pathological changes met with under this heading may vary considerably according to the severity of the disease and the structure particularly affected ; and although the chief types have received distinctive names for clinical convenience, it must be remembered that they are all forms of chronic inflammation with a tendency to hyperplasia. The following clinical conditions will be described :—

1. General chronic pharyngitis.
2. Granular pharyngitis.
3. Hyperplasia of the lateral bands of the pharynx.
4. Elongated uvula.

Before proceeding to discuss these varieties in detail, the broad etiological factors of chronic pharyngitis may be first mentioned, and the general principles of treatment considered.

General Etiology of Chronic Hyperplastic Pharyngitis.—It is doubtful how far the above conditions should be considered as diseases in themselves, or how far they should be looked upon merely as symptoms of other diseases. In the first place chronic pharyngitis, as already pointed out, is intimately associated with

disorders of the digestion (p. 176), and produces exaggerated symptoms in people of gouty or rheumatic tendencies (pp. 179 and 180). In the next place the visible pharyngeal changes do not afford a trustworthy guide to the type or severity of the symptoms. On the one hand it is astonishing how often even marked pharyngitis may exist without the patient being aware of its presence or complaining of any symptom whatever referable to the throat. On the other hand it is equally surprising how slight degrees of this trouble may in dyspeptic, rheumatic, gouty, or anaemic subjects cause pain and discomfort out of all proportion to the local lesion. It therefore seems reasonable to assume that these general conditions are the cause of the subjective symptoms and in some cases possibly of the actual morbid changes; though more usually other etiological factors give rise to the local changes, which however are seldom productive of symptoms unless some more general disorder is present.

The following causes of the local changes may be mentioned :—

(1) *Acute Pharyngitis.* Frequent attacks of acute inflammation in the pharynx may lead to chronic inflammatory changes.

(2) *Diseases of the Nose.*—Apart from acute rhinitis, which may extend to the pharynx and leave chronic pharyngitis, any nasal disease causing obstruction and consequent buccal breathing, or giving rise to secretions which flow backwards and cause hawking or coughing, is a frequent cause of chronic inflammation of the pharynx.

(3) *Climatic Influences.*—All forms of chronic pharyngitis are more common in damp, wet, and changeable climates.

(4) *Local Irritants.*—Many local irritants may directly reach the pharynx and cause or keep up chronic pharyngitis. They may be conveyed by the air, especially if nasal obstruction exists, or by articles of food and drink. Thus chronic pharyngitis is common in people whose occupation exposes them to irritating vapours or dust, and in those who indulge in the free use of strong condiments or the over-use of tobacco. Excess of alcohol is also a frequent source of chronic pharyngitis, which is partly due to local irritation and partly to the more general effects of alcohol in causing dilatation and paresis of the small blood-vessels and in upsetting the digestion.

(5) *Mis-use of the Voice.*—Some forms of pharyngitis may result from over-use and faulty production of the voice, and are therefore common in clergymen, teachers, actors, and singers.

General Treatment.—From what has already been said as to the etiology of chronic pharyngitis, it is evident that the general treatment is of far more importance than the local, and will in most cases alone effect a cure of the symptoms. Local treatment, however, may in some instances be necessary and may also be useful in arresting the symptoms pending the results of general treatment. Local measures will be described under the separate pathological conditions met with.

The general treatment consists broadly speaking in regulating the patient's habits and surroundings, in treating the underlying cause, and in improving the general health. In plethoric dyspeptic patients a morning dose of Friedrichshall water or some other mild aperient, the strict regulation of the diet, and treatment of the dyspepsia on general medical principles, are called for. If the patient's position and occupation allow of it, a course of treatment at some watering-place such as Ems, Homburg, Mont Dore, La Bourboule, or Aix-les-Bains, is always beneficial. If chronic pharyngitis occurs in anaemic patients, especially if the anaemia is associated with constipation, general treatment is very necessary: a morning dose of Carlsbad salts and the internal administration of carbonate of iron are indicated; and if such patients are thin and neurotic, careful feeding, change of air, and the administration of valerianate of zinc or a mixture of bromide of potassium and nux vomica will be found useful in relieving symptoms. Gouty or rheumatic tendencies should also be taken into consideration in the general treatment of chronic pharyngitis.

If the patient live in a damp low-lying place, a change of residence to a high, dry and bracing place should be recommended, when feasible. If the pharyngitis is caused, or kept up, by any of the local irritants already mentioned, the exciting cause should be removed. When due to over-use or mis-use of the voice, local rest followed by lessons in voice production will be found most efficacious both as a curative and preventive measure. If due to repeated attacks of acute catarrhal pharyngitis, the preventive treatment of "cold catching" which has already been described (p. 196) is important. Cold bathing followed by friction of the skin, suitable clothing, healthy outdoor exercise, avoidance of stuffy and over-heated rooms, are amongst the most useful measures. Finally early attention to abnormal conditions of the nose and naso-pharynx is important. Catarrhal conditions should be treated, sources of nasal obstruction corrected, and adenoids removed.

1. General Chronic Pharyngitis

Definition.—A general congestion and slight swelling of the mucous membrane of the pharynx, sometimes spoken of as a "relaxed throat."

Pathological Changes.—The mucous membrane of the pharynx is congested and of a dull red colour, especially noticeable over the soft palate, uvula, and anterior pillars, whilst the smaller veins may be dilated or varicose. The congested area fades gradually into the healthy mucous membrane. The surface is sometimes covered with a thin transparent film of mucus giving it a pellucid appearance. The soft palate is often wanting in muscular tone and hangs forwards away from the posterior wall of the pharynx, and, except in alcoholic subjects, responds sluggishly to irritation. The uvula is very often lengthened and sometimes thickened.

Symptoms.—Soreness, stiffness, and dryness of the throat, especially marked in the morning and usually, though not always, wearing off as the day advances, are the chief symptoms. Occasionally there is an irritation in the throat as if a hair had stuck there, ineffectual efforts to get rid of which cause coughing and hawking.

Local Treatment.—Soothing and mildly astringent applications are the most useful local remedies. The discomfort on waking in the morning can generally be quickly relieved by washing the pharynx with a solution of chlorate of potassium (12 gr. to 1 oz. of water), or chloride of sodium (10 gr. to the ounce) used as a spray or gargle. Gargles are beneficial in these cases because the palate and anterior faucial arches are chiefly affected. The pharynx should afterwards be sprayed with Neb. Menthol (p. 44). During the day mild astringents should be used as lozenges, sprays, or gargles. The most useful lozenge is the Troch. Krameriae (p. 59), one of which should be taken every four hours during the day. The following solutions used either as gargles or sprays are amongst the most efficacious : Garg. Aluminis, Garg. Aluminis et Potassii Chloratis (p. 57), and Garg. Boracis Co. (p. 58). If the pharynx is covered with a film of mucus, it should be sprayed with Neb. Alkalina (p. 31) before the astringent is applied.

These local remedies combined with the general treatment already described should soon give relief. If, however, the case prove obstinate, the pharyngeal mucous membrane should be painted by the surgeon with stronger astringents once or twice a

week. For this purpose the Pig. Ferri Perchloridi or the Pig. Zinci Chloridi are especially useful (p. 40), and in the meanwhile the patient may use Mandl's fluid (p. 38) as a paint once every day.

2. Granular Pharyngitis

Definition.—A chronic pharyngitis, characterised by small localised hyperplastic swellings of the lymphoid tissue round the ducts of the mucous glands on the posterior wall of the pharynx. Granular pharyngitis is sometimes spoken of as "clergyman's sore throat," as over-use and mis-use of the voice often seem to be an exciting cause.

Pathological Changes.—The granular swellings are small, red, and firm, and sometimes intensely injected, whilst there may be considerable dilatation of the veins between the granules. In many cases they are accompanied by a general chronic pharyngitis, the appearances of which have just been described, or by hyperplasia of the lateral bands of the pharynx (see below).

Symptoms.—The chief symptoms are pain and discomfort in the throat, some dysphagia, the sensation of a foreign body causing constant hawking, an irritable dry barking cough, and a sensation of heat, pricking, dryness, or some other form of paraesthesia. Complaints of aching at the back of the neck, and, in rheumatic patients, of pains shooting down the neck to the collar-bone (p. 180), are frequently made. The constant hawking and coughing causes a certain degree of secondary laryngitis, and so leads to weakness of the voice. Singers and speakers state that the voice is veiled on commencing to use it, that it soon becomes tired, and that after a few minutes of vocal effort the whole throat begins to ache to such an extent that they cannot proceed. There may also be real hoarseness.

Local Treatment.—Except perhaps in the case of voice-users local measures can only be considered palliative as long as the general conditions, on which the symptoms depend, remain active. Nevertheless in so far as local treatment may give prompt relief, it should be adopted in conjunction with the necessary general treatment. In slight cases, sprays, paints, or lozenges of an astringent or stimulating character are often sufficient. The best astringent sprays are those of alum (10 grs. to 1 oz.), sulphate of zinc, chloride of zinc, or perchloride of iron (p. 44), which salts may also be used as paints in stronger solutions (p. 40). The

most useful lozenge is that of krameria, but catechu or cubeb may be substituted. Pig. Mandl (p. 38) often gives great subjective relief, and is a good stimulant.

When the local condition is more marked and the symptoms are pronounced, destruction of the granular elevations with the galvano-cautery may sometimes be indicated. Seeing that the symptoms are so intimately associated with the general condition of the patient and will in time be relieved by general measures, this method of local treatment is thought by some to be unnecessary. Patients, however, desire speedy relief to their suffering, and this the judicious use of the cautery will usually afford, probably by producing counter-irritation rather than by destruction of morbid tissues; and as its careful and limited application does no permanent damage, it seems reasonable to employ it as a palliative measure in obstinate cases. It should be applied in the following manner: One or two of the most inflamed granules having been rendered anaesthetic (p. 64), a fine cautery point is heated to bright redness and the anaesthetised granules are carefully destroyed, care being taken that the cautery does not penetrate through the mucous membrane. After a week's interval one or two more granules may be destroyed in a similar way if necessary. It is never necessary to destroy all the granules, as often after the first application the symptoms will be so far relieved that the milder measures above mentioned will be sufficient to keep the patient comfortable. In singers and other voice users it is often astonishing how the destruction of one or two small granules will improve the tone, quality, and lasting power of the voice, but this good result may be helped by the use of slightly stimulating inhalations such as the Vapor Pini Sylvestris or Vapor Eucalypti (p. 53).

If the cautery is applied in the limited manner described it is followed by no pain or discomfort, and it is only necessary to keep the wounds clean by the use of a mildly antiseptic spray, such as the Neb. Potass. Permang. (p. 50).

3. Pharyngitis Hyperplastica Lateralis

Definition.—Hyperplasia of the lymphoid tissue situated in the lateral walls of the pharynx, giving rise to red thickened bands situated immediately behind the posterior pillars of the fauces, and corresponding to the salpingo-pharyngeal folds.

Pathological Changes.—Hyperplastic lateral pharyngitis is usually

bilateral, but often more marked on one side. It is characterised by congested dark red, though sometimes bright red, bands of thickened mucous membrane, starting below the tonsils and passing up behind the soft palate into the naso-pharynx. These are not always seen when the pharynx is at rest; but if the patient is made to retch, they stand out very prominently just behind the posterior pillars. There may be signs of simple chronic pharyngitis or of granular pharyngitis, but very often the lateral hyperplasia is the only pathological change.

Symptoms.—Lateral hyperplasia is often present without producing any symptoms, but is sometimes accompanied by great pain, discomfort, and dysphagia. There may be pain in the throat and at the back of the neck, or it may shoot down the neck towards the shoulder joints. Other symptoms described under granular pharyngitis may be present, but pain of a neuralgic type is the characteristic symptom of this affection.

Treatment.—Relief may generally be given by the local applications recommended for granular pharyngitis; but if there is much pain it may sometimes be advisable to divide each band in one or two places by cutting it across with a heated cautery point. In doing this it is important to avoid injuring the posterior pillars of the fauces, and the operation should therefore be carried out in the following manner: The site selected for the first incision is carefully and deeply anæsthetised together with the adjacent part of the posterior pillar; the cold cautery point is then introduced into the angle between the hyperplastic band and the posterior pillar, and used to pull the lateral fold towards the middle line well away from the posterior pillar. The cautery point is then heated and allowed to cut its way right through the swelling. Directly this is accomplished the point is withdrawn, the lateral fold being allowed to fall back into its place. This may be repeated on the opposite side after a week's interval. The result of this treatment is usually satisfactory, the pain and aching being relieved almost at once.

4. Elongated Uvula

Pathological Changes.—Generally the uvula is simply elongated, attenuated, and pendulous, but occasionally it is thickened as well. In either case, but especially if inflammatory thickening exist, its movements are impaired. Usually it does not exceed one inch in length, but in rare instances it may be considerably longer and

it may even hang down into the larynx. The rest of the pharynx may be healthy, or may present all the signs of simple chronic pharyngitis.

Symptoms.—Elongation of the uvula as a rule causes no symptoms whatever, but in irritable subjects, if it comes in contact with the epiglottis or base of the tongue, marked symptoms may sometimes result. Briefly these are the sensation of a foreign body with violent tickling in the throat, constant hawking and paroxysmal cough most marked on lying down in bed, vomiting especially first thing in the morning and after meals, and in rare cases laryngeal spasm. Occasionally these results of elongated uvula seriously reduce the patient's health, and the coughing may lead to emphysema of the lungs. In addition to these symptoms singers may experience some depreciation in the quality and strength of the voice.

Treatment.—In those rare cases where elongation of the uvula is giving rise to these symptoms local measures must be adopted.



FIG. 193.—Uvula forceps.

In slight cases without thickening, the application of one of the usual strong astringents (p. 40) two or three times a week and the use of krameria lozenges between whiles will be sufficient. In marked cases, amputation may be necessary. The following is the best method of performing this little operation: The uvula should first be painted with a 10 per cent. solution of cocaine, and then, a good light being reflected into the mouth, a long pair of special grip forceps (Fig. 193) are introduced into the mouth and passed back towards the uvula, being at the same time used to keep the tongue depressed. The uvula is seized with the forceps and held slightly forwards, whilst a pair of angular scissors (Fig. 194) are introduced and the uvula divided at about a third of an inch from its union with the soft palate. The blades of the scissors should be passed well over the uvula and held firmly whilst being closed, otherwise they may slip off and fail to sever the uvula completely. The cut surface should face backwards, so that it

is not irritated by the passage of food. Care must be taken not to pull on the uvula with the forceps, as the mucous membrane is very loosely attached to the underlying structures, and if dragged forward whilst being severed, the muscles will be denuded of their covering and healing will be very slow and painful.

The patient is often in no way inconvenienced by this little operation, but sometimes there may be considerable pain and difficulty in swallowing until the wound is completely healed,



FIG. 194.—Angular scissors.

especially when the uvula is thickened as well as elongated. The after-treatment consists in the frequent use of Garg. Potassii Permanganatis, and if there is pain, in the administration of anodyne lozenges or pastils such as the Troch. Boracis, Troch. Sedativi (p. 38), or the Pastil Bismuthi et Morphinæ. To relieve painful deglutition a cocaine lozenge or pastil may be given ten minutes before food. The food should be cold and semi-solid or liquid for the first twenty-four hours, and all condiments and other irritating substances should be avoided till the wound is healed.

One or two cases of troublesome secondary haemorrhage after amputation of the uvula have been recorded.

Various special instruments have been devised for removal of the uvula, such as special scissors to prevent slipping, guillotines, and snares, but with ordinary care the operation can be well performed in the manner above described.

II. CHRONIC TONSILLITIS

Two varieties of chronic tonsillitis are met with; namely, chronic hyperplastic tonsillitis or "enlarged tonsils," and chronic follicular or lacunar tonsillitis. The lingual tonsil may also be similarly affected, and may be conveniently included in this section.

1. Chronic Hyperplastic Tonsillitis

Definition.—A chronic inflammation of the tonsil accompanied by hyperplasia. In children the hyperplastic changes are especially marked in the lymphoid tissue, whilst in adults they affect the

whole gland and are characterised in the later stages by a large admixture of fibrous tissue.

Etiology.—The affection nearly always commences in childhood, and is caused in exactly the same way as hyperplasia of the adenoid tissue in the naso-pharynx (p. 382). Thus repeated colds and specific fevers are the most usual exciting causes, especially in children predisposed to lymphatic enlargements. Adenoids and chronic enlargement of the faucial tonsils often co-exist, in fact if the tonsils are enlarged in children adenoids will almost invariably be found. Simple enlargement of the tonsils commencing in adult life is rare, but may occur as a consequence of syphilis or one of the acute specific fevers.

Pathological Changes.—The tonsils are situated between the anterior and posterior palatine arches about on a level with the base of the tongue. The distribution of the lymphoid tissue forming them may be round or elongated, the former being the more usual. The round form usually covers an area of about half an inch from above downwards and a little less from before backwards. The elongated form extends further both upwards and downwards to a total extent of one and a half inches or even longer. These differences, as will be seen (p. 451), have a very important bearing on the method of treatment in pathological conditions. In depth a tonsil may vary considerably without being in any way abnormal. It may be no more than a little thickening of the mucous membrane, or it may take the form of a definite outgrowth (Fig. 195), and it is difficult to say at what point the size becomes abnormal. As a rough guide it may be stated that if a tonsil project inward beyond the posterior pillar it is abnormally large.

Tonsils with rounded attachments, when enlarged, project towards the middle line to a varying extent, and in the worst cases they almost or actually meet in the centre. They may be smooth and regular in outline, or irregular, ragged and honey-combed;

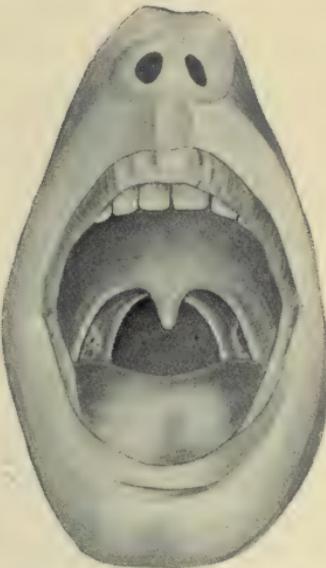


FIG. 195.—Normal oro-pharynx and tonsils.

they may be pale and succulent, or red and firm in appearance. In the elongated form of tonsil, the enlargement towards the middle line is never so great. There is a flattened swelling with a ragged irregular surface, sometimes extending so far down the pharynx that its lower margin cannot be seen even on firm depression of the tongue. Accompanying tonsillar enlargement there are often the signs of simple chronic pharyngitis (p. 443). As adult life is reached the tonsils become firmer and harder from the formation of fibrous tissue.

Symptoms.—As already stated, in children with enlarged tonsils adenoids are practically always present, consequently there are all the symptoms of post-nasal obstruction. The open mouth, the buccal breathing, the deafness and deformities of the chest which at one time were attributed to enlarged tonsils, are really due to the adenoids. Marked enlargement of the tonsils, however, adds considerably to the respiratory embarrassment, and consequently the symptoms of adenoids are greatly increased and pigeon breast is more likely to develop from interference both with buccal and nasal breathing. In addition to the symptoms of adenoids (p. 383) there may be some dysphagia, frequent attacks of sore throat accompanied by fever, enlargement of the cervical glands, aggravated cough, sometimes vomiting, and muffling of the voice. Lastly children with enlarged tonsils are much more prone to contract acute specific fevers, especially diphtheria and scarlet fever, than children with normal tonsils, whilst adults are liable to attacks of one or other form of acute septic tonsillitis, or to repeated attacks of catarrhal sore throat.

The Diagnosis is quite simple, though in adults the possibility of recent secondary syphilis must not be overlooked.

The Prognosis is good if appropriate treatment be adopted.

Treatment.—When tonsils have once become enlarged they seldom return to their normal size, but on the contrary tend to increase in size after any cold or acute illness during childhood. As adolescence is reached they tend to become firmer and more fibrous and may in consequence decrease in size to some extent, but they never entirely disappear. Except immediately after an acute attack of tonsillitis, the application of astringents is useless in both children and adults, and therefore if treatment is deemed necessary, removal or destruction of the enlarged tonsils must be undertaken.

Indications for Operative Interference.—In children with adenoids

which produce symptoms necessitating operation, there can be no doubt whatever that the tonsils, if enlarged, should be removed at the same time. It adds very slightly to the gravity of the operation, which can hardly be considered complete if unhealthy tonsils are left behind. The additional symptoms referable to the tonsils, and the increased risks of acute specific fevers, of repeated febrile attacks with sore throat, and of tuberculous infection of the glands of the neck, demand this imperatively.

In adults the chief indications are repeated attacks of acute tonsillitis, earache, deafness, nasal voice, and defective articulation. A word of caution is here necessary in relation to singers. If a person with enlarged tonsils has already learned to sing, that is, to adjust the voice to the impediment offered by the tonsils, it is disastrous to remove them suddenly. All control over the voice may be lost, and the patient will have to start learning all over again, and may never regain the control he formerly had. In people about to take up singing it is highly advisable to remove enlarged tonsils even though at the time they may not be causing any particular trouble, both because the quality of the voice will probably be improved thereby, and because the presence of enlarged tonsils may at any time be the source of acute or chronic inflammatory troubles which will seriously interfere with the use of the voice.

Choice of Method.—The tonsils may be removed with a tonsillotome, with a snare, or by enucleation, and they may be reduced in size with the galvano-cautery or with punch forceps. In deciding the particular method to be employed, the shape of the tonsil and the risk of haemorrhage are the chief points to be considered.

As regards the *shape of the tonsil* the original distribution of the lymphoid tissue in the lateral wall of the pharynx (p. 449) is important, for, when the tonsil enlarges, all the growth takes place inwards towards the middle line; its attachment to the side of the pharynx remaining practically the same. The results of enlargement may, therefore, be represented by the diagrams Figs. 196 and 197. It can readily be seen that complete removal with a tonsillotome or snare will be extremely difficult and usually impossible in the exceptional form, whereas it is a comparatively simple matter in the usual form.

The Risk of Haemorrhage increases in direct proportion to the amount of fibrous tissue in the enlarged tonsil, and the older the

patient and the greater the number of attacks of acute inflammation, the greater will be the quantity of fibrous tissue. The risk is reduced to a minimum by avoiding sharp-cutting instruments.

Bearing these points in mind it can be said (1) that the ordinary rounded tonsil may be removed with a tonsillotome in children

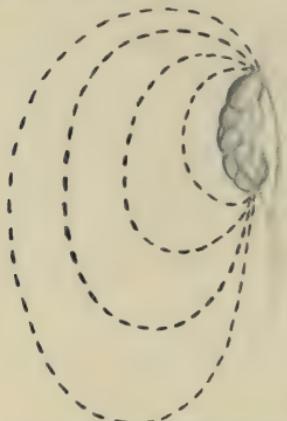


FIG. 196.—Diagram to show the way in which a rounded tonsil enlarges.

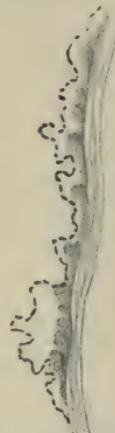


FIG. 197.—Diagram to show the way in which an elongated tonsil enlarges.

under sixteen, and, if there have not been frequent attacks of tonsillitis, up to the age of twenty; (2) that in adults, and adolescents who have had frequent attacks of tonsillitis, the tonsils should be reduced with the galvano-cautery unless they are exceptionally large, in which case they should be removed with a snare; (3) that elongated tonsils should generally be destroyed with the cautery, but if this is not successful and acute tonsillitis is of frequent occurrence, they should be enucleated.

Methods of Removal.—1. **With the Tonsillotome.**—In young children this is carried out under general anaesthesia before or after the removal of the adenoids in the manner described in Chapter xvi. p. 397.

In older children and young adolescents without adenoids it may be performed without any anaesthetic, or the tonsils may be painted over with a 5 per cent. solution of cocaine to allay nervousness.

The patient should be seated in a chair with an assistant behind him to support the sides of the neck and to press the tonsils gently inward from behind angle of jaw. The surgeon sits in front of the patient and reflects a strong light into the pharynx. The index finger of the left hand is then placed on the tongue so that the

tonsils may be seen, and Mackenzie's tonsillotome (Fig. 198), held in the right hand, is introduced with its cutting blade facing down-

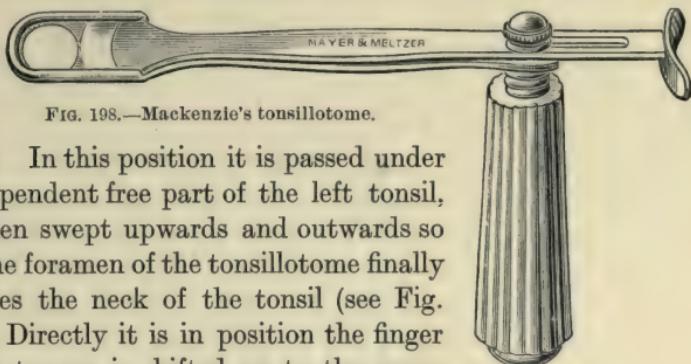


FIG. 198.—Mackenzie's tonsillotome.

wards. In this position it is passed under the dependent free part of the left tonsil, and then swept upwards and outwards so that the foramen of the tonsillotome finally encircles the neck of the tonsil (see Fig. 199). Directly it is in position the finger on the tongue is shifted on to the screw on the shaft of the tonsillotome to hold it firm and to make pressure outwards against the assistant's fingers, and the blade

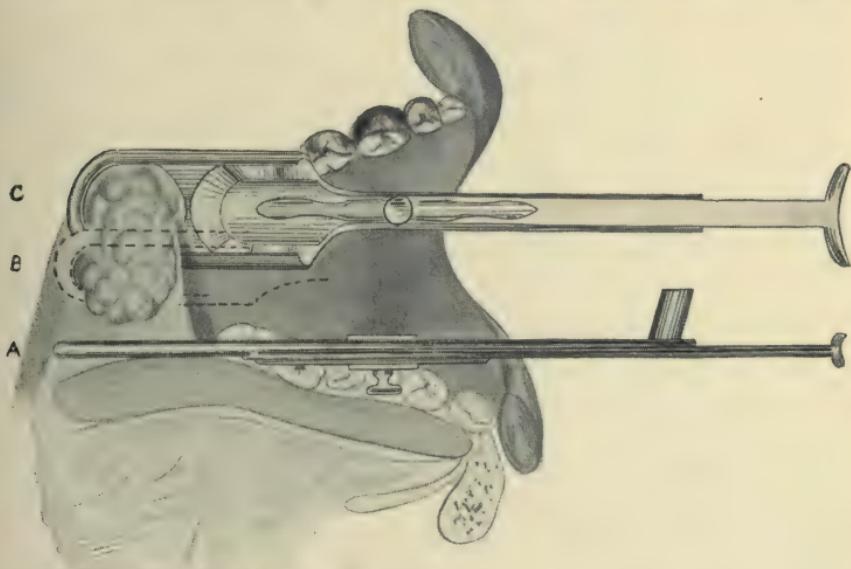


FIG. 199.—Removal of a tonsil, showing the tonsillotome A as introduced into the mouth, B passing round the tonsil, and C encircling the neck of the tonsil.

of the tonsillotome is sharply driven home. The instrument is then quickly seized with the left hand, and without removing it from the mouth, it is rapidly passed under and over the right tonsil which is then removed in a similar manner. If the tonsillotome is applied directly to the side of the tonsil and not manoeuvred round its neck, a portion only of the body of the

tonsil is squeezed through the aperture of the tonsillotome and removed, whilst the bulk of it is left behind. If too big a tonsillotome be used, it is apt to shift inwards at the moment the knife is being thrust home, leading to incomplete removal. If the tonsillotome be removed from the mouth after the first tonsil is amputated, it may entail much persuasion, loss of time, and even force before the mouth is again opened for removal of the second tonsil.

After-treatment.—The haemorrhage is generally very free for a few minutes after the operation is completed, but usually ceases on washing the mouth out with cold water. When it has quite stopped the patient may be sent home with instructions to use a spray of Condy's fluid (p. 50) frequently, and to abstain from taking anything hot or solid for forty-eight hours. The wound generally heals in the course of a week or ten days without any trouble.

If sharp-cutting instruments are used in unsuitable cases, severe haemorrhage is not unusual, and will be very difficult to arrest. Fortunately it nearly always ceases of itself when the patient becomes faint, and does not recur. Haemorrhage causing syncope, however, is not a trifling matter. Delicate people may take many months to recover from it and the robust will be detained from work for days and even weeks, and an attempt must therefore be made to arrest it. Powerful styptics such as the strong solution of perchloride of iron or gallic-tannic acid paste were at one time chiefly used, but they should as a rule be avoided on account of the inflammation which they cause. If persistent oozing occur, the patient should lie down on his side with the head slightly raised, in such a position that the blood will escape from the mouth, and he should continuously suck ice. If this is not successful or if the bleeding is very free a light should be thrown into the pharynx, sponge pressure applied, and the bleeding point or points determined. If the blood is coming from one big vessel, its mouth should be seized with a pair of pressure forceps, which should be retained on the vessel for a few hours and then removed. If from one or two smaller vessels an attempt may be made to seal them with Paquelin's cautery. If there is general oozing of the wounded surface, the bleeding must be restrained as far as possible by pressure on the tonsil with sponges, supported by counter-pressure with the fingers on the neck. The sponge may be soaked in a strong solution of hazelin or a 5 per cent. solution of supra-renal extract. If the bleeding cannot be controlled by

any of these methods syncope will soon supervene, when, as has been said, the haemorrhage usually ceases and does not recur. If however it persist, it will be necessary to ligature the external carotid artery.

Removal by Snare.—This is especially indicated in adults with very large tonsils, which have been frequently inflamed. It is a slow and painful, though an easy method, and a general anaesthetic is therefore advisable. A stout snare, threaded with the strongest wire it will carry, is required. The patient having been anaesthetised, the mouth is held open with a gag and a good direct or reflected light thrown on to the pharynx. The loop is passed round the tonsil, and guided by the left index finger over its neck. The wire is tightened quickly till the attachment of the tonsil to the pharynx is grasped, and then very slowly, until it is severed. As a rule there is practically no haemorrhage and the entire tonsil can in this way be successfully removed.

Enucleation is indicated in adults who suffer from repeated attacks of acute tonsillitis and peritonsillitis, which other methods have failed to arrest. This most usually occurs in instances of flat, elongated, unhealthy tonsils which cannot be removed satisfactorily either with a tonsillotome or a snare. Enucleation of the tonsil is thus performed:—a general anaesthetic is administered, the patient's mouth is propped open and the tongue depressed with a Smith's gag, and a good direct or reflected light is employed. An incision is made at the reflection of the mucous membrane from the posterior surface of the anterior pillar of the fauces on to the tonsil, sufficiently long to admit the index finger. The finger is then passed through the incision towards the attachment of the tonsil to the lateral wall of the pharynx, taking great care to keep outside the capsule of the tonsil. The attachment is then broken down with the finger and the tonsil removed.

Cauterisation.—This is especially indicated in adults with unhealthy, though not excessively enlarged tonsils, and in singers in whom removal might lead to the difficulties already described. It can be carried out under local anaesthesia without any suffering. Cocaine is applied to the tonsil in the usual way (p. 64), and the cautery point, heated to a bright cherry redness, is plunged into the substance of the tonsil and the hole thus made enlarged so that it assumes the shape of a cone, the base of which is on the surface of the tonsil. Two or three such cone-shaped holes may be made at one sitting, and after a week's interval the opposite

tonsil may be similarly dealt with. Each tonsil will require three, four, or five sittings, and then a month's interval should be allowed, so that the maximum amount of contraction that is likely to occur may be estimated. If the tonsils are still too large the cautery should be again applied in a similar manner on two or three occasions, and finally, unhealthy patches on the surface of the tonsils are superficially cauterised. In this way the tonsils can be quite sufficiently reduced in size and the liability to acute tonsillitis removed.

Between each sitting the throat should be kept clean by a spray of Condy's fluid (p. 50), and if there is any pain the eucalyptus pastil will be found comforting.

Reduction with Punch Forceps.—This is indicated in the same class of cases as the former, especially when there is any occasion for celerity. Local anaesthesia is sufficient. Two or three portions of the tonsil may be removed at a sitting with Tilley's tonsil forceps.

Chronic Lacunar or Follicular Tonsillitis

Definition.—A chronic inflammation of the lacunæ of the tonsil accompanied by unhealthy secretion.

Etiology.—This form of chronic tonsillitis is especially connected with acute attacks of the same variety, and often seems to be associated with insanitary surroundings, or with any source of chronic infection about the nose or teeth. It occurs in both children and adults.

Pathological Changes.—In simple cases the enlargement of the gland is usually very slight, but disease of the lacunæ may occur in tonsils which have previously become enlarged, especially in children. The chief characteristic is the filling of the lacunæ with yellowish plugs of epithelial débris mixed with pus cells, products of fatty degeneration, and a variety of septic organisms. The tonsils, therefore, are studded with small yellow spots varying in size from a millet seed to a pea. Occasionally similar yellow spots may be seen on the faucial pillars or on the lateral wall of the pharynx behind the posterior pillar, but more often they are confined to the tonsils. There is often a big plug of this cheesy material retained in the supra-tonsillar fossa, which is sometimes hidden from view and can only be found with the help of a probe. As a rule there is but little surrounding inflammation.

Symptoms.—The subjective symptoms vary in degree with the number of the lacunæ affected and with the amount of retained secretion in them and also with the sensibility of the patient. One plugged lacuna in a neurotic subject may cause considerable distress, whilst in others very many plugs may give rise to no symptoms. Pain, aching, roughness, and irritation of the throat with slight dysphagia may be complained of. The retained secretions often have a peculiarly offensive odour and taste. The symptoms commence gradually and increase in severity until the plugs escape from the lacunæ, when relief is obtained. Sub-acute exacerbations are very liable to occur. If a collection occurs in the supratonsillar fossa the symptoms are often very marked and persistent, and such collections are frequently the source of repeated attacks of acute peritonsillitis (p. 426).

The Diagnosis of chronic lacunar tonsillitis is generally quite easy. Pharyngo-keratosis is the only trouble with which it may be confused (p. 477).

Treatment.—If the tonsils are enlarged as well as affected with lacunar disease, their removal by means of a tonsillotome is by far the simplest and most efficacious method of treatment. In young children a general anæsthetic should be given, but in older children the operation may be performed without an anæsthetic, unless there are adenoids to be removed at the same time. The methods of operating both with and without general anæsthesia have been fully described on pp. 397 and 452.

In adults or singers in whom removal of the tonsils is not advisable, or in cases where the tonsils are but little enlarged, destruction of the affected lacunæ is the best method of treatment. This is best done with the electric cautery. The tonsil should be anæsthetised with a 10 per cent. solution of cocaine, and a good illumination of the pharynx having been obtained, the secretion from three or four lacunæ should be squeezed out with a probe or gently scraped away with a pharyngeal curette, and the lining membrane of the lacunæ should then be destroyed and its opening enlarged by galvano-cautery. This should be repeated on other lacunæ at intervals of a week until all the diseased lacunæ have been dealt with. If the cautery is not at hand a finely pointed stick of nitrate of silver should be inserted into the lacunæ and rotated, which answers very well. Combined with this local treatment general measures according to the condition of the patient must be carried out. Tilley recommends the removal of

the diseased lacunæ by means of his punch forceps as being a quicker method than the cautery.

When the supra-tonsillar fossa becomes filled with unhealthy secretions which are the source of persistent irritation or repeated attacks of peritonsillitis, special efforts must be made to destroy all the unhealthy lacunæ which may empty themselves into this cul de sac, and to reduce the size of the upper part of the tonsil sufficiently to allow of the free escape of any secretions which may find their way into it. This will generally put an end to the symptoms, but occasionally enucleation of the tonsil may be necessary (p. 455).

Disease of the Lingual Tonsil

The lingual tonsil is situated behind the circumvallate papillæ and anterior to the epiglottis (p. 18), and is especially marked on either side of the base of the tongue. It may be involved in any of the acute or chronic affections to which the faucial tonsils in adults are liable, but as it is developed later in life than the other tonsils it causes no trouble in childhood, and with rare exceptions plays a very secondary part in acute affections in adults. Chronic enlargement may, however, very occasionally give rise to symptoms if it is sufficiently big to impinge upon and irritate the upper surface of the epiglottis. Between the hyperplastic nodules of lymphoid tissue large veins, often tortuous, can frequently be seen, to which great importance was at one time attached, but which have since been proved to be of no importance.

The Symptoms which may occasionally arise from enlarged lingual tonsil are sensation of a foreign body, tickling and irritation, giving rise to constant hawking, paroxysmal coughing, and impairment of the voice.

Treatment.—Such symptoms, when no obvious cause for them can be detected in the naso-pharynx, pharynx, or larynx, are very frequently due to errors of digestion, and a course of general medicinal and dietetic treatment is then all that is required. If, however, they persist, and the lingual tonsil is manifestly large enough to irritate the epiglottis, local measures must be adopted. In slight cases astringent paints or the application of tincture of iodine or Mandl's fluid may be sufficient. Nitrate of silver (30 grs. to the oz.) and chloride of zinc (20 grs. to 1 oz.) are the most useful astringents. They should be applied on tampons of cotton wool

attached to a curved carrier. The patient is directed to open his mouth and hold his tongue forward with his left hand. The surgeon adjusts the light and introduces the laryngeal mirror with his left hand, and then, with the help of the view obtained, he introduces the wool carrier with his right hand and guides it on to the enlarged tonsil, which is then thoroughly painted.

If paints are not successful in relieving the symptoms, the galvano-cautery may be tried. The tonsil is first carefully painted with 10 per cent. solution of cocaine with the usual precautions against swallowing it (p. 62), and then a curved cautery point is guided with the help of the laryngoscope on to the tonsil, and one or two punctures made into its substance. Care must be taken not to penetrate through the whole depth of the tonsil into the substance of the tongue, for cases of diffuse cellulitis of the base of the tongue have been known to follow too free use of the cautery in this region. Cauterisation may be repeated at intervals of a week until the tonsil is sufficiently reduced to relieve the symptoms. Between the sittings the mouth should be frequently cleansed with the Garg. Potassii Permanganatis used as a mouth wash.

If the lingual tonsil is excessively large it may be removed with a snare or with Brady's lingual tonsillotome. If there are many varicose veins, the snare should be used. Local anaesthesia is necessary in either case, and the selected instrument should be guided over the enlarged tonsil with the help of the laryngoscope as described for applying paints. The patient should have a bland soft diet for a few days after the operation and use an antiseptic mouth wash.

III. CHRONIC PHARYNGITIS SICCA

Two forms of dry pharyngitis are met with, namely, the simple and the foetid.

Simple Dry Pharyngitis.—**Etiology.**—The chief etiological factor of this condition is the passage of cold unmoistened air over the mucous membrane of the pharynx; thus it is a frequent complication of both varieties of simple dry rhinitis (p. 298), of abnormal patency of the nasal cavities, and of nasal obstruction which involves buccal breathing. As regards abnormal patency of the nasal cavities, dry pharyngitis is commonest when one cavity is unusually wide and the other is obstructed, as in some instances of deviated septum; for then one side of the

nose has to attempt to do the work of both sides in warming and moistening the air, and its mucous membrane soon becomes dry, and pharyngitis sicca quickly follows. Dryness of the pharyngeal mucous membrane also occurs as a symptom of indigestion.

Pathological Changes.—The mucous membrane is red, glazed, and very dry, especially that covering the posterior wall of the pharynx, scattered over which small black or grey crusts may sometimes be seen. Slight granular pharyngitis may complicate the case. When secondary to the anaemic form of dry rhinitis the pharyngeal mucous membrane is generally pale, thin and glazed.

Symptoms.—The chief symptoms are a feeling of intense dryness in the throat, aching, and troublesome hawking and coughing if crusts are present. The patient frequently complains that he wakes up suddenly in the night with a sensation of being choked, which causes him great alarm.

Treatment.—The most important therapeutic measure is the treatment of the nasal condition on which the dryness of the pharynx depends. (See rhinitis sicca, Chap. xi.; deformities of the septum, Chap. xii., &c.) Whilst this is being carried out some relief may be given to the pharyngeal symptoms by palliative measures. The fauces should be frequently gargled and the posterior wall of the pharynx sprayed with a weak solution of common salt (a teaspoonful to a pint of water), after which the nebula menthol should be freely used. The symptom of dryness may often be relieved by allowing one of the following lozenges to melt in the mouth :—

Troch. Acidi Carbolici	see page 58.
Troch. Potassii Citratis	3 gr. in black currant paste.
Troch. Pyrethri	1 gr. " "

The choking sensation on waking in the night may be relieved by a sip of water followed by one of the above lozenges.

Fœtid Dry Pharyngitis.—**Etiology.**—This is invariably secondary to atrophic rhinitis, though occasionally the gravity of the pharyngeal condition is out of all proportion to that of the nose.

Pathological Changes.—Excessive dryness of the pharyngeal mucous membrane with the presence of foetid crusts is the chief pathological change. The mucous membrane is red and glazed, and sometimes looks almost cracked with dryness.

Symptoms.—Great discomfort, some difficulty in swallowing, and foul breath are the chief symptoms.

Treatment.—The first essential is to treat the nose as described under atrophic rhinitis (p. 311). For the relief of the pharyngeal symptoms it is important to free the pharynx from crusts and as far as possible to keep it free. The surgeon should himself remove the crusts as often as may be necessary. Swabs of cotton wool soaked in peroxide of hydrogen and attached to a carrier should be held in contact with each crust for a minute or so, and then the pharynx should be washed with a coarse spray of nebula alkalina (p. 31). Between the visits to the surgeon, the patient should treat himself in the manner just described for simple dry pharyngitis.

CHAPTER XX

NEW GROWTHS

I. INNOCENT TUMOURS: *Papilloma—Fibroma—Angioma—Adenoma—Dermoid Cyst—Growth resembling Parotid Tumours.* II. MALIGNANT GROWTHS: *Sarcoma—Carcinoma—Indications for Methods of Removal.*

I. INNOCENT GROWTHS

THE following innocent tumours have been met with in the pharynx:—Papilloma, fibroma, angioma, adenoma, dermoid cysts, and growths resembling parotid tumours.

Papillomata are fairly common and are most usually seen on the tip of the uvula, on the edges of the palate, or on the anterior faucial pillars. They have the same objective characteristics as papillomata elsewhere, being pale coloured growths, usually soft and pedunculated, though sometimes sessile, with a granular cauliflower-like surface. They rarely attain to any great size or give rise to symptoms. Occasionally they grow rapidly and cause a sense of uneasiness in the throat, tickling, dry paroxysmal cough, and vomiting.

Treatment.—It is not always necessary to interfere with a small papilloma, but if any symptoms are present, or if it increase in size, it should be removed together with a small portion of the mucous membrane immediately around it. This may be done with scissors or snare under local anaesthesia. Cocaine is applied in the ordinary way (p. 64) and a good light thrown into the pharynx. If scissors are used, the growth should be pulled away from its attachment to the pharynx with forceps whilst it is being divided; and if a snare is used it should in like manner be pulled forward whilst the loop, previously passed over it, is being tightened. In this way an area of healthy mucous membrane will be removed together with the growth, and thus the chance of possible recurrence reduced. A simple mild antiseptic mouth wash, such as Garg. Potassii Permanganatis (p. 57), should be used two or three times a day till the wound is healed.

Fibromata.—Fibromatous growths are not common, but some-

times occur on the tonsils and more rarely on the velum or palatine arches. They are hard to the touch, pinkish-white in colour, rounded in outline, and sessile, but as they grow the surface becomes lobulated, and they sometimes become pedunculated. Occasionally they grow very rapidly. When small, they produce no symptoms; but when large, they interfere mechanically with the functions of the part, causing dysphagia, occasionally dyspnoea, and difficulties in articulation.

Treatment.—If sessile, a general anaesthetic is usually necessary, except when the growth is very small, in which case it can be dealt with as described for papilloma. The mucous membrane is snipped with scissors all round the growth, which is then pulled forwards with forceps and its attachment divided. The haemorrhage is generally fairly free, but can be arrested by pressure. If the growth is pedunculated, it should be removed with a snare, under local anaesthesia.

Angiomata are rare, but are sometimes met with at the junction of the hard and soft palate, or on the posterior wall of the pharynx. They give rise to some pain and dysphagia.

Treatment.—Angiomata should always be removed; but the operation is attended with some anxiety owing to the risks of haemorrhage, and requires considerable care. A general anaesthetic is administered, and an incision made all round the growth at a distance of a quarter of an inch from its attachment. It is then slowly and carefully separated with the finger, blunt dissector, or scissors, great pains being taken not to wound the growth itself. Sponges on holders and pressure forceps should be at hand to control the haemorrhage should any big vessel be divided, and a Paquelin's cautery to seal smaller vessels should there be brisk general oozing. The after-treatment consists in keeping the wound clean by the frequent use of an antiseptic lotion such as the Collunarium Sanitas or Collunarium Boro-glyceride (p. 29) used as a spray.

Adenomata may be met with in the palate and sometimes attain to a very great size. If small, they produce no symptoms; but if large, pain, difficulty in swallowing, alteration of the voice, and sometimes dyspnoea may occur.

Treatment.—If it causes symptoms, an adenoma should be removed under general anaesthesia. When small, an incision should be made over the growth, the mucous membrane dissected off, and the tumour enucleated. When large, an elliptical incision

should be made round its base and the growth dissected out. One or two stitches will in this case be necessary to close the wound. Very free haemorrhage sometimes occurs, and the means of controlling it must be at hand.

Dermoid Cysts.—These tumours are generally discovered *post mortem* in infants who are born dead or who die a day or two after birth, but are occasionally found in older children. They are composed of fatty material with a fibrous stroma, and show traces of muscular tissue, cartilage and bone. They are covered with skin containing hair follicles and both sebaceous and sweat glands. They are pedunculated, and can easily be removed with scissors or snare.

Growths resembling Parotid Tumours.—These growths have lately been described as endotheliomata. They may be considered innocent in that they probably never become disseminated, though they may occasionally recur locally after removal. They may be met with in the soft palate, palatine arches, tonsils, or the posterior wall of the laryngo-pharynx, and they are pink in colour, fleshy in appearance, and have a rounded contour. When situated in the oro-pharynx the symptoms are not marked until the growth has become sufficiently big to interfere mechanically with the functions of the part. Alteration of the voice, difficulty in swallowing, and possibly dyspnoea will then arise. When in the laryngo-pharynx, such symptoms occur much earlier.

Treatment.—These growths should as a rule be removed. This may in some instances be successfully done with a snare under local anaesthesia, but it is usually better to give a general anaesthetic and dissect out the tumour, taking care not to break through its capsule.

II. MALIGNANT GROWTHS

Malignant growths of the pharynx and upper part of the larynx are not uncommon, both sarcomata and carcinomata being found, more frequently the latter. Clinically they are sometimes difficult to distinguish from each other, but as their course, symptoms, prognosis, and treatment are the same, this is not of any great consequence.

Sarcomata.—Nearly every variety of sarcoma may occasionally occur in the pharynx, but the round-celled and the spindle-celled are the commonest. They are most usually met with in

the tonsils, but the soft palate, the palatine arches, or any part of the posterior wall may be affected.

There always has been, and still is, considerable confusion of ideas as to sarcoma of the tonsil. On the one hand, there is no doubt that primary sarcoma does occur, and, on the other hand, it is certain that the tonsils may be affected in the course of lymphadenoma (Hodgkin's disease), or in diffuse lympho-sarcomatosis. Both clinically and pathologically primary sarcoma is very different from these latter affections. It runs the ordinary malignant course and is unaffected by any general treatment, but may in some instances be cured by early and complete removal. In lymphadenoma and diffuse lympho-sarcomatosis, the growth in the tonsil is but a part of a more widely distributed affection. Relief may often be given to the local manifestations by both general and surgical measures, such as the internal administration of arsenic and the removal of the tonsillar growth and the cervical glands ; but no cure can be anticipated as other structures already are, or will shortly become, involved. These general conditions will not be discussed here, except to emphasise the fact that the tonsillar growth may often be reduced or controlled in a most astonishing manner by the internal administration of arsenic in increasing doses.

Primary sarcoma of the pharynx is usually met with towards the end of middle life, though cases commencing about puberty are not uncommon. It generally runs a very rapid course, ending fatally within a year of its commencement. Occasionally, however, it may follow an exceptionally slow course, lasting eight, ten and even twelve years. It is characterised by early and extensive enlargement of the glands at the angle of the jaw and often of those in the anterior and posterior triangle of the neck, whilst numerous secondary growths in other parts of the body are not uncommon.

Pathological Changes.—A sarcoma generally occurs as a distinct prominent tumour, round, smooth, pinky-red in colour, and sometimes coarsely lobulated. At first the mucous membrane is unbroken, but usually ulceration takes place, extending deeply into the substance of the tumour. The growth may remain limited for a long period, but it eventually spreads to neighbouring structures, and when it occurs in the tonsil, may penetrate through the lateral wall of the pharynx and cause a large swelling at the angle of the jaw.

Carcinomata of the Pharynx are much commoner in the male than in the female, and are generally met with after middle life. Almost any part of the pharynx may be attacked. Epithelioma is the usual variety.

Pathological Changes.—Wherever situated in the pharynx, a carcinoma soon acquires its essential characteristics of a hard

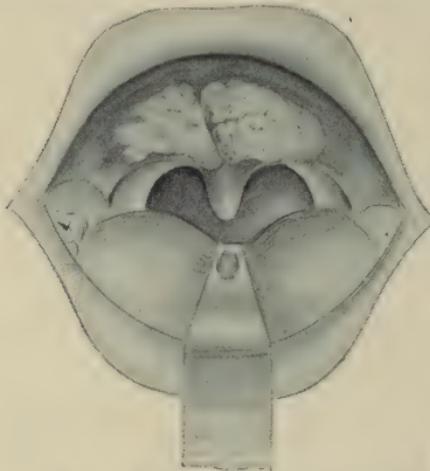


FIG. 200.—Epithelioma of the soft palate.

infiltrating growth (Fig. 200). Ulceration is not long delayed, when the typical malignant ulcer is quickly established. The glands of the neck are nearly always involved early in the course of the disease, and sometimes the enlargement is out of all proportion to the size of the primary growth. Wherever it commences it is apt to spread to neighbouring structures with great rapidity.

SYMPTOMS, DIAGNOSIS, AND TREATMENT OF MALIGNANT DISEASE OF THE PHARYNX

The Symptoms depend on the position and size of the growth. At first they may be altogether absent, the patient frequently seeking advice for the swelling in the neck ; but as the growth extends there is mechanical interference with the functions of the parts. Thus there may be dysphagia, alteration of the voice, and occasional dyspnoea. When ulceration occurs there will be pain of lancinating character shooting up to the ears and increased by swallowing, troublesome salivation, very foetid breath,

rapid wasting and cachectic symptoms, and sometimes severe haemorrhage.

Diagnosis.—Malignant growths must be distinguished from innocent growths and tertiary syphilis. Early enlargement of glands and the infiltrating character of the growth point to malignancy. Syphilis can often be excluded by the result which follows large doses of iodide of potassium. In all doubtful cases the removal and microscopic examination of a portion of the growth must be relied on for a definite diagnosis.

Prognosis.—If left untreated by operation a fatal issue is likely to result in from six to eighteen months from the first symptoms, though, as already pointed out, a few cases of sarcoma will run a very much slower course. If the patient is seen early and the disease thoroughly eradicated the prognosis is somewhat more hopeful. The possibility of eradication, however, depends greatly on its situation and extent, as will be seen below.

Treatment.—Surgical measures offer the only chance of eradicating the disease, but if, owing to the extent or position of the growth, these cannot be adopted, palliative methods must be employed.

Surgical Treatment aims at the complete removal of the growth together with an area of healthy tissue around it, and should not be attempted unless there is every chance of being able to carry this out effectively. The immediate risk to life, and the functional activity and ultimate condition of the part must also be considered.

The position and limitation of the growth are, therefore, most important points in determining the feasibility and advisability of operation. From this aspect growths may be thus classified:—

1. Those confined to the soft palate or to one of the anterior faucial pillars.
2. Those situated in and around the tonsil.
3. Those affecting the epiglottis and its immediate surroundings.
4. Those affecting the arytenoid cartilages and the structures in their immediate vicinity.

In determining the treatment to be adopted in these various groups, the depth to which the growth penetrates from the surface, and the extent of the glandular infection must be fully

considered. Provided, however, that the glands are removable, that the case is seen early, and that the structures are not too deeply or extensively involved, it may be said, speaking quite generally, that operative measures may be undertaken in the first division with good, and in the second with very fair prospects of success; that in the third group the outlook is not so good as in the second, but still fairly hopeful; that in the fourth group operation should not be undertaken unless the disease is extremely limited. This statement is based on the cases reported and collected by Watson Cheyne, from which it may be gathered that the chances of recovery after operative measures depend on the answers to two questions: (1) whether the growth can be removed without making a communicating wound from the pharynx to the neck, and (2) whether it is necessary to remove parts of both pharynx and larynx. In the first of the above divisions the operation can always, and in the second generally, be carried out through the mouth without making a communication with the wound in the neck, and therefore the chances of recovery are good. In more extensive cases coming under the second division and in those of the third division it is necessary to open the pharynx through the neck, and the outlook, therefore, is not nearly so good, but in properly selected cases there is hope of recovery. In the fourth division, in which parts of both larynx and pharynx have to be removed, the prospects are very bad, though when the disease is quite limited, an operation may be justifiable.

As regards the exact operation to be performed, no very definite rules can be laid down: an operation suitable to each particular case must be thought out. If the disease is confined to the soft palate, uvula, anterior pillars, or tonsil, and is limited in extent, it can often be removed by cutting well round the growth with knife or scissors through the mouth, with or without a preliminary tracheotomy. In slightly more extensive cases if they are still confined to the palate and fauces, the growth may be reached through the mouth after splitting the cheek from the corner of the mouth back to the ascending ramus of the jaw. If, however, the disease is still more extensive, and accompanied by glandular enlargement, more extensive operations are necessary.

For extensive disease of the tonsils and pharynx the following procedure may be adopted:—

1. Expose the anterior, and, if necessary, the posterior triangle of the neck, and thoroughly remove the glands and fascia.
2. Expose, and pass ligatures loosely round the external and internal carotid arteries, which can be tied later if haemorrhage occurs.
3. Perform a laryngotomy, insert a tube, and pack the upper part of the larynx with a sponge.
4. Split the cheek from the corner of the mouth right back to the ascending ramus of the jaw.
5. Remove the growth and some healthy tissue all round it with scalpel, scissors, blunt dissector, and finger.
6. Arrest the haemorrhage.
7. Bring the edges of the mucous membrane together with stitches when possible.
8. Sew up the cheek.
9. Remove the ligature from the internal and external carotid arteries.
10. Make sure that the wound in the pharynx is dry, and then remove sponge from the larynx.
11. Sew up the wound in the neck after inserting a drainage tube.
12. Remove the laryngotomy tube, but leave the wound open.

If splitting the cheek does not give sufficient room, more space may be obtained by dividing the posterior belly of the digastric and stylo-hyoid muscles (Watson Cheyne), by dividing the lower jaw (Langenbeck), or by removing the ascending ramus of the lower jaw (Mikulicz).

In cases coming under the third division, and in still more extensive ones coming under the second, lateral pharyngotomy as recommended by Watson Cheyne or sub-hyoid pharyngotomy must be performed.

In limited cases of the fourth division, Lack has recently secured successful results in two or three instances by performing a low lateral pharyngotomy in the following manner :—

1. An incision is made along the anterior border of the sterno-mastoid.
2. The glands are cleared out from the anterior triangle of the neck.
3. The pharynx is opened by a longitudinal incision behind the posterior border of the thyroid cartilage.

4. The growth is exposed and clipped away with scissors, together with a half-inch margin of healthy tissue.

5. If both larynx and pharynx have been wounded in the removal of the growth, the mucous membrane of the arytenoid and interior of the larynx is carefully sutured to that of the lateral wall of the pharynx.

6. The opening into the lateral wall of the pharynx is closed.

7. The skin incision is sutured, after inserting a drainage tube.

8. The Hahn's tube is retained in the trachea till the patient can swallow comfortably.

Whatever operation be selected, the glands in the neck must always be thoroughly removed. Butlin strongly recommends that in cases of malignant disease of the tonsils the glands should be cleared out as a routine practice, whether they can be felt to be enlarged or not. He advises that this should not be done at the time of the internal operation, but three weeks or so later. Further, in nearly all cases a preliminary tracheotomy with the introduction of a Hahn's tube is necessary, though sometimes laryngotomy with the introduction of a sponge into the upper part of the larynx is sufficient.

Ultimate Results.—If the case has been properly selected in the first instance, and the patient survive the immediate dangers of the operation, there are good prospects of considerable prolongation of life. In some instances secondary operations for the removal of glands may be necessary, and occasionally life may be further prolonged by the prompt removal of recurrences. A few patients will pass the three years' limit without recurrence, and so may be spoken of as cured. Early diagnosis and early operation offer the best or only chance of successful results.

The Palliative Treatment.—Locally, antiseptic mouth washes, such as sanitas, boro-glyceride, or permanganate of potassium must be frequently used, and pain relieved by the application of orthoform alone or with equal parts of iodoform once or twice daily. Insufflations of morphine or the application of a 5 per cent. solution of cocaine will also give temporary relief.

Internal medication is not of much use except for the relief of pain. As this is often very great, the free use of hypodermic injections of morphia is often beneficial and always justifiable. Late in the course of the case tracheotomy may be called for to

relieve dyspncea and rectal feeding to support the strength. If deglutition becomes impossible whilst the patient is otherwise in fair condition, gastrostomy may be performed. It not only enables the patient to be fed, but the consequent functional rest to the pharynx is often followed by great relief from pain. Sometimes the removal of a portion of a growth from the pharynx will give relief for a time.

CHAPTER XXI

NEUROSES AND UNCLASSIFIED CONDITIONS OF THE PHARYNX

I. NEUROSES: A. *Motor*—Spasmodic Affections—Paralysis.—B. *Sensory Neuroses*—Anaesthesia—Paræsthesia, &c. II. FUNGOID AFFECTIONS: 1. *Thrush*. 2. *Keratosis*. III. CALCULI. IV. FOREIGN BODIES. V. DILATATION. VI. PERFORATIONS OF THE ANTERIOR PILLARS OF THE FAUCES. VII. HÆMORRHAGE. VIII. PULSATING ARTERIES. IX. ASYMMETRY OF THE PHARYNX.

I. NEUROSES OF THE PHARYNX

NEUROSES of the pharynx may be divided into motor and sensory affections. Motor neuroses may be further divided into spasmodic affections and paryses.

A. MOTOR NEUROSES

(1) **Spasmodic Affections.**—Three varieties of spasmodic affections are met with, (a) *globus hystericus*, (b) *choreic movements*, and (c) *nystagmus* or *rhythrical movements* of the pharynx. The two latter varieties are rare. Apart from these, spasms of the pharyngeal muscles may occur in *tetanus* and *hydrophobia*.

Etiology and Pathological Changes.—(a) *Globus hystericus* is generally met with in women and is part of a more general neurosis. There are no visible changes in the pharynx, but the sensation of a rising lump is supposed to be due to spasmodic contraction of the pharyngeal muscles. (b) *Choreic movements* have been noticed in cases of *chorea*, *paralysis agitans*, and occasionally in purely neurotic cases, or they may sometimes be associated with acute affections of the pharynx. On examination of the pharynx, irregular muscular contractions of the soft palate and lateral walls of the pharynx can be observed. (c) Cases of *nystagmus* of the pharynx may be divided into two classes, (1) those due to some grave central lesion, such as *tabes dorsalis*, *general paralysis*, *cerebral tumours*, or *meningitis*, and (2) those due to reflex irritation set up by

some local pathological condition, such as nasal polypi, adherent crusts or post-nasal catarrh. In the former class, very much the larger, the laryngeal muscles as well as the pharyngeal are always implicated; whilst in the latter the movements are more often chiefly confined to the soft palate. On examination rhythmic movements of the palate and sides of the pharynx can be seen to occur as often as from 60 to 120 times in a minute. The palate moves vertically and is sometimes accompanied by similar movements of the floor of the mouth and epiglottis, whilst the lateral walls of the pharynx move towards the middle line. The movements of the palate are often accompanied by an audible clicking sound. If the larynx is implicated rapid adduction movements of the cords and arytenoids, generally synchronous with those of the pharynx, can be observed.

Treatment.—In *globus hystericus* and other cases of purely neurotic origin, the general treatment is more important than the local. Generous diet, change of air, and tonics are indicated, whilst valerianate of zinc with asafoetida in the form of a pill (p. 360) or bromide of potassium may help to control the pharyngeal symptoms. Locally the application of the Faradic current, either to the neck or to the palate, has been followed by improvement. In cases of nystagmus of central origin but little can be done, and the prognosis is very grave. In reflex nystagmus the pharyngeal symptoms may be arrested by the careful treatment of the source of irritation.

(2) **Pharyngeal Paryses.**—The soft palate and more rarely the constrictors of the pharynx may be affected.

The *causes* of the paralysis may be thus classified:—

A. *Diseases of the Nerves.*

1. Central.

- (a) Growths affecting the vago-accessory nuclei or nerve fibres.
- (b) Acute or chronic bulbar paralysis.
- (c) Tabes dorsalis.
- (d) Syringo-myelia.

2. In the course of the nerve.

- (a) Pressure of new growths.
- (b) Pressure of enlarged glands.
- (c) Pressure of gummata.

3. *Peripheral.*

- (a) Toxins of diphtheria, influenza, &c.
- (b) Lead and arsenic poisoning.

B. *Myopathic*, due to

- (a) Acute tonsillitis (p. 429).
- (b) Injuries.
- (c) Removal of adenoids (p. 396).

C. *Hysteria* and other neuroses.

Pathological Changes.—Paralysis of the soft palate is generally bilateral, though unilateral cases are met with. When bilateral the palate hangs downwards and forwards away from the posterior wall of the pharynx, and there are no attempts at movement when the vowel "ah" is phonated. When unilateral the velum palati is drawn towards the sound side, whilst the affected side is lower, less arched, and immobile.

Symptoms.—The voice is nasal and articulation imperfect, resembling that due to cleft palate, and when fluids are swallowed a portion is returned through the nose. If the constrictors of the pharynx are affected deglutition becomes more and more difficult and sometimes impossible, but fluids always cause more difficulty than solids.

Diagnosis.—Stricture of the pharynx or oesophagus must be excluded. The fact that solids are more easily swallowed than fluids, and the passage of a bougie if necessary, will establish the diagnosis.

Treatment.—*General Treatment* will vary with the cause: if the paralysis is due to some central lesion, treatment is of little avail; if due to the pressure of growths or glands in the course of the nerve, removal of the cause is sometimes possible; if due to gummatous, iodide of potassium must, of course, be given; if to influenza or diphtheria, full doses of strychnine and iron (p. 195) should be administered; if to lead or arsenic poisoning, appropriate treatment should be promptly adopted. In myopathic cases no special general treatment is called for, whilst in hysterical cases the treatment suggested for functional aphonia (p. 553) should be carried out.

Local Treatment.—Toxic, myopathic and hysterical cases may be somewhat helped by local measures. Gargling the pharynx with cold water, applying cold douches to the nape of

the neck, bathing the throat and chest with cold water, and the use of the faradic current have been found useful. As recovery begins to take place phonetic exercises for bringing the palate into action are also serviceable.

B. SENSORY NEUROSES

Anæsthesia, hyperæsthesia, paræsthesia, and neuralgia may occur.

Anæsthesia may be partial or complete, and unilateral or bilateral. It occurs in connection with hysteria or other neurotic conditions, with peripheral neuritis, such as that due to diphtheria, and with central lesions, such as bulbar paralysis. When unilateral it may be due to pressure from a tumour on the glossopharyngeal nerve.

Hyperæsthesia is always bilateral, and occurs chiefly in connection with hysteria, pulmonary tuberculosis, alcoholic pharyngitis, and dyspepsia.

Paræsthesia may also be due to hysteria, or may occur as an early symptom of pulmonary tuberculosis. It is also associated with sexual hypochondriasis in the male or the climacteric period in the female; and with anaemia, dyspepsia, gout, or rheumatism in either sex. Finally, it may be caused by even slight chronic inflammatory conditions of the mucous membrane of the pharynx in neurotic subjects, or may be secondary to catarrh of the nose or naso-pharynx. Amongst the symptoms of paræsthesia may be mentioned tickling, or the sensation of a hair, fishbone, or other foreign body in the throat; a sense of suffocation, a feeling of heat or cold, itching, paroxysmal or barking cough, or constant hawking, and sometimes dysphagia, on account of which the patient reduces the diet to liquids only.

Neuralgia of a very distressing character may occur in the pharynx and radiate down the neck without any apparent local cause. It occurs chiefly in anaemic women or in gouty phthisic men.

Treatment.—In all these sensory neuroses of the pharynx, the underlying cause must be the first and chief object of the treatment. Energetic local treatment in neurotic subjects often does more harm than good by concentrating the patient's attention on the trouble. If, however, any local lesion can be found

in the pharynx, which might act as an excuse for the sensory disturbance, it should be corrected as far as possible. In neuralgia, Mackenzie says the application of tincture of aconite three or four times a day to the pharynx is of the greatest benefit. In anaesthesia, and occasionally in paræsthesia, the application of the faradic current may be of service. Generally speaking, nerve tonics, change of air, rest, avoidance of worry, and occasionally a course of treatment at some watering-place, will greatly facilitate a cure. In markedly neurotic subjects with aggravated local symptoms and general wasting a course of Weir-Mitchell treatment is often efficacious.

II. FUNGOID AFFECTIONS OF THE PHARYNX

The common varieties of fungoid affections met with in the pharynx are thrush and keratosis. *Mycosis sarcinica* and *aspergillus mycosis* are occasionally found.

1. THRUSH

Thrush is due to the growth of the *oidium albicans* or *oidium lactis*, the two fungi being probably identical. The mouth is generally first, and the pharynx only secondarily, affected. It occurs in infants, especially in those who are hand-fed, in the aged and feeble, and in adults towards the end of a long and exhausting illness.

Pathological Changes.—At first little white spots about the size and shape of a large pin's head are seen scattered over the surface of the mucous membrane; these tend to coalesce and form large white patches somewhat irregular in shape and often attaining the size of a shilling-piece. The fungoid growth is at first slightly adherent, and its removal causes a little excoriation of the surface of the mucous membrane.

Symptoms.—Discomfort and some slight difficulty in swallowing are the chief local symptoms, but in infants the onset of thrush is often accompanied by some general disturbance such as sickness and diarrhoea with a little elevation of temperature. It must be remembered, however, that thrush is common in infants who have diarrhoea, especially in severe cases ending fatally. In such cases the anus and nates often become inflamed and excoriated.

Treatment.—In hand-fed infants thrush is often a purely local affection, and not necessarily due to enfeebled resistance through illness. In these cases the treatment consists in keeping the bottles and india-rubber nipples absolutely clean, and in sponging out the infant's mouth with a solution of boracic acid (4 grs. to the oz.) after every bottle. Careful attention to the details necessary for absolute cleanliness in hand-feeding will both prevent and cure the trouble.

When thrush occurs in those whose resisting power is enfeebled from illness, general treatment is most important, but the mouth and pharynx should be kept clean by swabbing them with a solution of borax, boracic acid, or permanganate of potassium, especially after food has been taken, and the throat should also be frequently sprayed with the Neb. Alkalina (p. 31).

2. KERATOSIS

This affection has been described as pharyngo-mycosis or mycosis leptothricia of the pharynx, because it was thought to be due to a growth of *leptothrix buccalis*. Kelly and others, however, have shown that this fungus is probably accidental, as in some cases it is not present, and that the disease is essentially due to a keratosis of the epithelium.

Etiology.—Nothing is known as regards the etiology of this disease. It occurs in otherwise healthy individuals generally between the ages of twenty and forty, and slightly more often in women than in men. Some chronic lacunar tonsillitis is often present. In some instances the patient may be somewhat run down in general health, but as keratosis occurs as frequently in people in robust health, this is probably coincidence.

Pathological Changes.—Small isolated, tough, firmly adherent white excrescences or plaques (Kelly) are seen on apparently healthy mucous membrane. The excrescences are composed of keratinised epithelium, entangled with which microbes and generally some filaments of *leptothrix* can be found. The faucial tonsils, the base of the tongue, and the lateral pharyngeal walls are the parts most usually affected. The process probably starts in the epithelium lining the crypts of the glands.

Symptoms.—Keratosis may produce no symptoms at all, but there may be some roughness and irritation of the throat

causing hawking and coughing, and a sour taste in the mouth.

Diagnosis.—Keratosis must be distinguished from lacunar tonsillitis. In keratosis the spots are milky white in colour, firmly adherent to the mucous membrane, and generally widely distributed over the tonsils, pharynx, and base of the tongue. In lacunar tonsillitis the spots are yellow in colour, easily removable, and usually confined to the tonsils.

Treatment.—As local symptoms are absent or insignificant, as the general health is not affected, and as the morbid process tends to die a natural death, treatment cannot be looked upon as a matter of very great importance. Attempts were at one time made to remove the small outgrowths, or to destroy them with the galvano-cautery or, on the assumption that they were due to *leptothrix*, with strong antiseptics or chemical caustics. All these methods are comparatively useless, and, having to be continued for long periods, cause more local distress and mental anxiety than does the disease. If the local condition is left untreated the spots tend in the course of time to become less adherent and finally to separate and disappear. Consequently the only treatment to be recommended is the use of the Coll. Alk. (p. 29) as a mouth wash and as a throat spray night and morning, combined with tonics and change of air should they seem necessary.

III. CALCULI OF THE PHARYNX

Calculi composed chiefly of phosphate or carbonate of lime, embedded in which filaments of *leptothrix* can usually be found, may form round retained secretions or small foreign bodies. They are found in the tonsils, supra-tonsillar fossa, or in the palate. They vary in size from a millet seed to a pigeon's egg, and may be light, soft and crumbling, or hard and heavy; finally, the exposed surface may be smooth and polished or rough and irregular.

Symptoms.—Patients may be unaware of anything abnormal in the throat or may complain of pain of a stabbing character, sometimes shooting up to the ears, and of recurrent attacks of simple or suppurative inflammation. A calculus hidden away in the supra-tonsillar fossa may cause pain, tenderness, and recurrent attacks of acute tonsillitis.

Treatment.—Calculi should always be removed. If they are small, this can be done under local anæsthesia (p. 64) by means of forceps or of a scoop or hook. If they are large and partially embedded beneath the mucous membrane, a general anæsthetic is usually required, and one or two incisions should be made radiating through the overlapping edge of the mucous membrane. The forefinger or a blunt dissector is then passed behind the calculus in order to remove it.

IV. FOREIGN BODIES IN THE PHARYNX

Large foreign bodies such as a bolus of food or false teeth may become impacted in the lower part of the pharynx and give rise to urgent dyspnoea or dysphagia. They will be described under Foreign Bodies in the Larynx (Chap. xxvi.). Small sharp foreign bodies may become lodged in the fauces or any part of the pharynx, but most usually in the tonsils. As examples may be mentioned fish-bones, pins, needles, and bones or small fragments of meat or poultry.

Symptoms.—The chief symptoms complained of are pain of a stabbing character increased by deglutition and the sensation of something sticking in the throat. Nervous patients are apt to get very frightened and excited, and constantly perform the act of swallowing in the hope of getting rid of the foreign body. The possibility of secondary acute pharyngitis and the formation of an abscess has already been mentioned under acute traumatic pharyngitis (p. 436).

Amongst the more unusual results of swallowing foreign bodies may be mentioned surgical emphysema of the neck from perforation of the pharyngeal wall; severe haemorrhage from penetration into the carotid artery or other big vessel; and deep-seated suppuration in the neck or mediastinum.

Diagnosis and Treatment.—If a small foreign body is supposed to have stuck in the pharynx, the first step is to make a most thorough examination of fauces, base of the tongue, tonsils, pharynx, and pyriform fossæ. Great care is necessary in order that it may not be overlooked, especially if it be a fish-bone, which is often extremely difficult to see. A strong artificial light should be reflected into the pharynx, the tongue well depressed, and the fauces, tonsils, and upper part of the pharynx

examined seriatim, not only by sight but with a metal probe, and finally, if necessary, with the finger. Exploration with the finger or a probe should be done with the utmost gentleness for fear of pushing a sharp pointed substance entirely below the surface of the mucous membrane, and possibly through it into important structures. If this examination reveal nothing, the base of the tongue and the lower part of the pharynx and pyriform fossæ must next be examined with a laryngoscope, and later with the finger if necessary. Sometimes a small ecchymosis or clot of blood will indicate its position. In the case of metallic foreign bodies impacted in the lower part of the pharynx, the use of the Röntgen rays may be immensely valuable in locating them. If in any of these ways a foreign body is detected it should be removed with a forceps, straight or curved according to its position. If it cannot be found or removed with the forceps, an umbrella propang may be passed down closed as far as the cricoid, and then opened and withdrawn. This may be attended with success, but no force should be used, and no attempt made to push the foreign body into the œsophagus and onward into the stomach, as the walls of the alimentary canal, some big vessel, or other important structure may thus be injured with disastrous results. Sometimes swallowing large mouthfuls of new bread will carry the foreign body with it into the stomach. If this occur and the foreign body is such as may be likely to injure the lower parts of the alimentary canal, it has been recommended that the patient's diet should be limited to a free supply of potatoes for two or three days, and that purgatives should be avoided.

When no foreign body can be found it must not be assumed that none is present even though the most careful search has been made, for more often than not the patient's sensations are a correct guide to its presence or absence. The examination should therefore be repeated on the following day and no effort spared to locate it. Occasionally however the foreign body may have only caused a scratch or it may have become dislodged and have been swallowed or expectorated, and then the continuance of the symptoms are chiefly due to the nervous state of the patient. Under these circumstances bromide of potassium in fifteen grain doses should first be given two or three times a day, while soothing inhalations or sprays should be employed locally.

V. DILATATION OF THE PHARYNX

A general or sacculated dilatation of the pharynx may occur. The sacculated form gives rise to the accumulation of food in the pouch, and this causes a good deal of discomfort. The pouch can be emptied by pressure in the neck. The discomfort due to the entrance of food into the pouch can be prevented by pressure over it during deglutition, but the condition can be cured by operative measures on the lines suggested by Butlin for diverticulae of the oesophagus. An incision is made in the neck and the pouch dissected out and removed, and the divided edges of the pharynx carefully united with sutures.

VI. PERFORATION OF THE ANTERIOR PILLARS OF THE FAUCES

Perforations of varying size, either unilateral or bilateral, are by no means uncommon in the anterior pillars of the fauces.

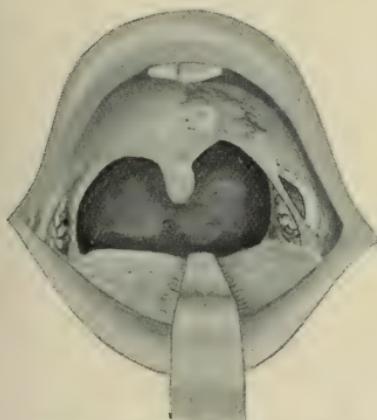


FIG. 201.—Perforation of the left anterior pillar of the fauces, of syphilitic origin.

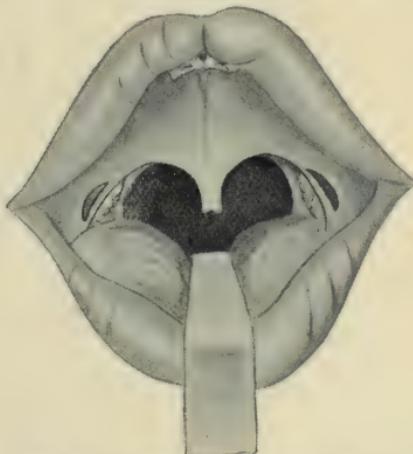


FIG. 202.—Bilateral perforation of the anterior pillars of the fauces, of congenital origin.

There are two distinct classes of cases; firstly, those occurring in otherwise healthy throats, and those evidently due to some destructive disease, such as syphilis. In the latter cases the cause is evident, and they present no special features (Fig. 201). The former class of cases have no clinical significance and require no treatment, but their etiology is a question of interest. They

may be first noticed at almost any age from childhood upwards, and are commoner in females than in males. They are almost certainly developmental in origin, though many surgeons maintain that they are frequently due to local suppuration in childhood, especially that following scarlet fever. In the majority of instances, however, there is an entire absence of scarring or other sign of past disease, so that such cases may as a rule be considered to be developmental. Fig. 202, representing the pharynx of a girl aged fourteen, strongly supports this view. Not only is there bilateral perforation of the anterior pillars, but the uvula is bifid, the median raphe of the hard palate is strongly marked, and the upper lip suggests an incipient median hare-lip. This figure should be contrasted with Fig. 201, in which the scarring of the posterior wall of the pharynx, the distortion of the palate, and the cicatrices around the perforation, make it evident that the condition is the result of disease.

VII. HÆMORRHAGE FROM THE PHARYNX

Hæmorrhage from the pharynx only requires mention in order to emphasise the fact that it is extremely rare, unless there is some gross lesion to account for it. It is said to occur in the course of such diseases as purpura, hæmophilia, leukæmia, and pernicious anæmia, but an actual escape of blood is extremely rare, though submucous extravasations are less uncommon (Kidd). Various minor local lesions have also been looked upon as sources of hæmorrhage, of which dilated veins may be especially mentioned. These in rare instances may give way, but the resulting hæmorrhage is seldom more than sufficient to cause staining of the saliva or expectoration. Of the gross lesions which may cause severe hæmorrhage malignant disease is the commonest, but it may also occur in tertiary syphilitic ulceration, septic phagedænic ulceration, and acute peritonsillar abscess.

Blood expectorated from the mouth is therefore but rarely of pharyngeal origin. In a few instances it may run into the mouth from the nose or naso-pharynx, but much more often it is the result of tuberculous disease of the lungs, even though examination of the chest may reveal no signs of tuberculosis.

VIII. PULSATING ARTERIES

Pulsating arteries, usually symmetrical, are not uncommonly seen behind the posterior pillars of the fauces. They are generally the ascending pharyngeal arteries, though sometimes the internal carotids.

When they exist especial care should be exercised to avoid injuring them in all minor operations about the pharynx.

IX. ASYMMETRY AND IRREGULARITIES OF THE PHARYNX

These conditions are due to irregularities or exostosis of the underlying vertebræ. Unusual prominence of a vertebra may cause difficulties in the removal of adenoids, and if very marked may give rise to symptoms of nasal obstruction. Curvature of the cervical portion of the spine may cause narrowing of the lower portion of the pharynx with some difficulty in swallowing; and twisting of the vertebræ may cause so much asymmetry of the pharynx as to suggest the presence of a retro-pharyngeal abscess or a tumour. Careful examination with the finger or a probe will prevent mistakes.

SECTION VI

DISEASES OF THE LARYNX

CHAPTER XXII

ACUTE INFLAMMATORY AFFECTIONS

I. SIMPLE ACUTE LARYNGITIS: A. *In Adults*.—B. *In Children (Spasmodic Laryngitis or Croup)*. II. ACUTE AFFECTIONS DUE TO LOCAL INFECTION: A. *Superficial Septic Laryngitis*.—B. *Submucous or Acute Oedematous Laryngitis*.—C. *Acute Septic Perichondritis*.—D. *Membranous Laryngitis*. III. TRAUMATIC LARYNGITIS.

ACUTE inflammatory processes which may attack the larynx may be described under the following headings:—

- (1) Simple Acute Laryngitis, or Acute Laryngeal Catarrh.
- (2) Acute Inflammations associated with General Infections.
(See Chapter iv.)
- (3) Acute Inflammations due to Local Infections.
- (4) Acute Traumatic Laryngitis.

I. SIMPLE ACUTE LARYNGITIS, OR ACUTE LARYNGEAL CATARRH

A. IN ADULTS

Acute Catarrhal Inflammation of the Mucous Membrane of the Larynx may occur by itself, though more often it is but a part of a general catarrh of the upper respiratory tract, and is also often associated with tracheitis and bronchitis. As a rule it is a trivial disorder; but it is often of serious moment to voice-users, both by reason of immediate incapacity and of the possibility of a consequent chronic catarrh leading to deterioration of the voice. Some people are subject to attacks of acute laryngitis every spring and autumn, and to them it is a very serious inconvenience.

Etiology.—The causes of acute catarrh of the larynx are, speaking generally, precisely similar to those of acute rhinitis (see p. 189), but the following are specially important:—chronic rhinitis, atrophic

rhinitis, or any abnormality producing nasal obstruction ; chronic laryngitis ; sedentary habits ; the abuse of alcohol, especially by gouty or rheumatic subjects ; and previous attacks.

Pathological Changes.—Three stages can be observed similar to those of rhinitis (p. 191). In the first there is injection, slight swelling, and dryness of the mucous membrane, which may be general, or more often limited to the cords and arytenoids. In the second stage the swelling increases but to no great extent, though occasionally there may be very slight œdema about the arytenoids. The inflammation may extend to the muscles and cause impaired movements of the cords. Any set of muscles may be affected, but most usually the tensors or the arytenoideus. In the third stage these objective signs gradually diminish and the larynx slowly returns to a normal condition.

Symptoms.—The *first stage* is ushered in by chilliness, a feeling of malaise, and a slight rise of temperature, rarely exceeding 100° F. (37.8° C.). There is some discomfort about the larynx, accompanied by a sensation of rawness and itching, which leads to a dry noisy cough with a metallic ring. The voice quickly becomes hoarse and rasping. In the *second stage* all the symptoms tend to become more aggravated. Phonation becomes painful, and the voice is often completely lost ; the cough is hard and distressing, and is accompanied by a scanty secretion of clear mucus, difficult of expectoration. There may be some dysphagia, especially on swallowing the saliva, and finally the larynx may be tender and painful on external pressure. In the *third stage* a free muco-purulent secretion is established, with the appearance of which the subjective symptoms all improve. The cough becomes easy, phonation less painful, and the voice gradually returns.

In rare instances slight haemorrhages may occur in the course of acute laryngitis, especially amongst women in the pregnant or puerperal condition. This is sometimes described under the special name of Laryngitis Haemorrhagica.

Prognosis.—As a rule, with ordinary care the disease runs its course in from five to ten days, and ends in complete recovery. In exceptionally severe or neglected cases, the redness and thickening of the vocal cords and the infiltration of the muscles may persist for weeks and even months, in which case the voice, though it returns to some extent, remains thick and hoarse, and effort is necessary to speak audibly. Though improvement takes place with time, a persistent and troublesome chronic laryngitis is often

left, which is very serious for singers and others who need to use the voice.

Treatment.—*Of the Initial Stage.*—*General Treatment.*—If it is important to check the laryngitis with all possible expedition, the method of treatment recommended for the initial stage of acute rhinitis (p. 192) should be carefully carried out.

Local Treatment.—When a rapid recovery is essential the first indication is to obtain functional rest for the part affected, and with this object in view the use of the voice must be entirely prohibited. Coughing, which is often very troublesome, must also be checked, and the respiratory movements of the cords minimised by keeping the patient quiet in bed. To check the cough a sedative cough mixture should be given, and in very bad cases the local application of $\frac{1}{2}$ grain of morphia diluted with 2 grains of starch should be made by means of a laryngeal insufflator guided by the laryngoscope (see p. 42).

For useful cough mixtures, and for other methods of preventing cough, see pp. 126 and 518.

The second indication is to check and reduce the inflammatory process by local applications to the larynx. This is best effected by means of steam inhalations, of which the Vapor Tincturæ Benzoini (p. 52) is by far the most useful. It should be used every three or four hours, and after its use the larynx should be sprayed with the Nebula Menthol (p. 44), which will be found to give great relief. Many other inhalations, such as Vapor Creosoti and Vapor Eucalypti (p. 53), have been recommended, but they are too stimulating for this stage of acute laryngitis.

Externally a cold compress, or Leiter's tubes, should be placed over the larynx (p. 45). Blisters, sinapisms, or other counter-irritants over the thyroid cartilage are sometimes useful in the very early stages, and again later if the condition threatens to become chronic, but cold compresses are the most beneficial external application.

By means of these general and local measures an acute laryngitis can often be checked, and a voice user may be able to return to work in about forty-eight hours' time. Occasionally, however, the surgeon is appealed to only a few hours before a professional engagement, and immediate relief is demanded, so that "just this one engagement" may be kept. It is very wrong for a person dependent on his voice for his living to sing when the larynx is inflamed. He may do it many times with impunity, but there is

always a risk of permanent injury to the voice, or at all events of setting up chronic laryngitis, which will require many months' rest and treatment before the parts are again sufficiently restored to health to allow of their use. This should be put most strongly before the patient, but if, as is usually the case, he insists on keeping his engagement, efforts must be made to enable him to use his voice for the occasion. For this purpose Watson Williams recommends a hypodermic injection of $\frac{1}{30}$ grain of strychnine, and, twenty minutes before the engagement, a glass of vin de coca Mariani, whilst the following solution should be used with an atomiser and well inhaled :—

R.	Menthol	6 gr.	= 0·41 gm.
	Morphine	$\frac{1}{2}$ gr.	= 0·034 gm.
	Cocaine	2 gr.	= 0·134 gm.
	Oleic acid	15 m.	= 0·95 c.c.
	Colourless vaselin oil	$\frac{1}{2}$ oz.	= 15 gm.

Some singers find it difficult to use the voice after the local application of cocaine in any form, and to such the benzoic acid lozenge (p. 58) may be recommended, one or two to be taken a quarter of an hour before using the voice. In other cases the constant sucking of ice, with the application of a cold compress to the neck, and the use of an astringent spray may tide over the difficulty (perchloride of iron, 45 gr. to 1 oz., or chloride of zinc, 10 gr. to 1 oz.).

Treatment of Second Stage.—Clinically the second stage is not well defined from the first, but when the above treatment has failed to arrest the attack, various modifications should be adopted, chiefly with the object of establishing free secretions, for the dry stage is painful and distressing. In place of sudorifics the following mixture should be substituted :—

R.	Nitrate of potassium	10 gr.	= 0·69 gm.
	Carbonate of ammonium	5 gr.	= 0·34 gm.
	Spirits of ether	10 m.	= 0·62 c.c.
	Infusion of senega	to 1 oz.	= 30 c.c.

and if secretion is not quickly established, the Vapour of Chloride of Ammonium (p. 54) may be tried instead of the Vapour of Tincture of Benzoin, or chloride of ammonium lozenges may be given.

Occasionally chloride of ammonium, administered internally in large doses, is most useful for establishing a free secretion, and

therefore the following mixture may be given every six hours for three doses or so as an alternative to the above mixture :—

R.	Chloride of ammonium	30 gr. = 2·06 gm.
	Liquid extract of liquorice	30 m. = 1·87 c.c.
	Chloroform water	to 1 oz. = 30 c.c.

Treatment of the Third Stage.—This stage if neglected may pass on to chronic laryngitis, and therefore its treatment is important. Directly the secretions have become quite free, tonics should be substituted for expectorants. Iron is the most useful form, for, besides being a tonic, it seems to influence the course of the catarrhal process favourably (p. 59). The diet should be nourishing, and often a little stimulant, such as good burgundy or port, will be of service.

Locally, stimulating inhalations should first be used, of which the Vapor Pini Sylvestris and Vapor Eucalypti are the most useful (p. 53). If however the case is slow in clearing up, local astringents should be applied as paints or sprays (pp. 40 and 44), and the treatment generally should be that of chronic laryngitis (p. 515). If the laryngeal muscles remain infiltrated and sluggish in action as a result of the acute inflammatory process, this treatment must be continued until recovery is complete. Prolonged rest of the voice is essential ; and the application of astringent paints are indicated, whilst later on the judicious use of the Faradic current is beneficial.

Should haemorrhage occur during the course of the laryngitis, it may require special treatment. It can generally be arrested by putting the patient to bed, and administering ice by the mouth, and at the same time keeping cold applications to the neck. The cough, which is generally the immediate cause of the haemorrhage, should be controlled by the means suggested above. Between the attacks of bleeding the larynx should be painted for a few days with astringents, such as perchloride of iron (120 grs. to the oz.), iron alum (60 grs. to the oz.), or nitrate of silver (30 grs. to the oz.) ; or the same astringents may be used more dilute by means of a spray.

Preventive Treatment.—In persons who are prone to contract laryngitis frequently preventive treatment should be advised ; which speaking generally is the same as for colds in the head (p. 196). Special attention however must be given to any nasal or naso-pharyngeal abnormalities, and every effort must be made to clear up any chronic laryngitis which may exist.

B. ACUTE LARYNGITIS IN CHILDREN

(Spasmodic Laryngitis or Croup)

Special mention must be made of acute laryngitis in children, as it is very often attended with considerable swelling within the larynx, causing serious symptoms and calling for special treatment. In some cases the symptoms are the same as in adults, only more severe in type. The temperature generally rises to 100° or 101° F., the cough is hard and brassy, and there is often some inspiratory embarrassment especially after coughing, and all the symptoms are worse at night. In other children the symptoms are very slight during the day, but severe paroxysms of dyspnoea occur at night, from which symptom the affection is often called spasmodic laryngitis, laryngitis stridulosa, or in nurseries "croup." The nocturnal paroxysm is probably due to collection of inspissated secretions on an inflamed mucous membrane. It is commonest in infants between the ages of one and four, in whom the larynx is extremely small, but the attacks may recur up to eight or nine years of age. Certain children are liable to periodic attacks of this form of laryngitis, and it often seems to run in families. In nearly every case more or less enlargement of the faucial and pharyngeal tonsils will be found, accompanied by more or less chronic nasopharyngitis and probably laryngitis. These conditions are undoubtedly predisposing causes.

Symptoms and Course.—The usual history in cases of croup is that the child has been out of sorts for a day or two, and that there has been some hoarseness accompanied by a croupy cough. He goes to bed no worse, but awakes about midnight with a severe attack of dyspnoea, which for the time is most alarming. After about ten minutes the severity of the attack passes off, and presently the child falls off again into a fairly natural sleep. Such an attack may be repeated two or three times during the night, and may recur several nights in succession. The dyspnoea may occasionally prove fatal, but as a rule the coughing and struggling dislodge the inspissated mucus, and relieve the dyspnoea.

Diagnosis.—It may often be difficult to distinguish between acute laryngitis in infants and diphtheria. The chief points of diagnostic value are mentioned under membranous laryngitis (p. 506). Laryngismus stridulus must also be excluded (p. 539).

Treatment.—This may be divided into the treatment of the laryngitis, and the treatment of the attack of croup.

Of the Laryngitis.—In children with a tendency to “croup,” any symptoms of acute laryngitis should be promptly and energetically treated. The patient should be put to bed in a warm well-ventilated room, the temperature of which should be 70° F. (20.1° C.). A tent should be constructed round the bed and the steam kettle used, one teaspoonful of compound tincture of benzoin being added to each pint of water, and hot fomentations or poultices should be kept on the neck. Medicinally a purgative should be given at the onset of the symptoms, such as the following:—

R.	Mercury with chalk	2 gr. = 0.14 gm.
	Bicarbonate of sodium	2 gr. = 0.14 gm.
	Carbonate of magnesium	5 gr. = 0.32 gm.

and the following mixture must be given every four hours:—

R.	Ipecacuanha wine	2 m. = 0.12 c.c.
	Solution of acetate of ammonium	15 m. = 0.94 c.c.
	Carbonate of ammonium	½ gr. = 0.034 gm.
	Syrup of tolu	10 m. = 0.62 c.c.
	Water	ad 1 dr. = 3.75 c.c.

If the cough is troublesome, 2 grains of bromide of potassium or 4 to 6 minims of compound tincture of camphor may be added. The household remedy of rubbing the neck and chest with camphorated oil often seems to have an appreciable effect in cutting short the attack, and should be tried. If the cough is sufficient to prevent sleep, Bosworth advises codeine rather than opiates in the following formula, one teaspoonful of which should be given every two hours for a child of seven and less in proportion for younger children:—

R.	Dilute hydrocyanic acid	2 m. = 0.12 c.c.
	Codeine	1½ gr. = 0.097 gm.
	Carbonate of ammonium	16 gr. = 1.095 gm.
	Cherry laurel water	ad 2 oz. = 60 c.c.

If acute laryngitis is accompanied by nasal catarrh it is most important to keep the nostrils as clear as possible by frequently washing them with Coll. Alkalimum half the usual strength (p. 29). If the child is under four years old, this is best done according to directions given on p. 198; but if over four, a small rubber syringe may be gently used.

Of Croup.—If the child wake with a paroxysm of dyspnoea, he must be plunged as quickly as possible into a hot-water bath of a temperature of 100° F. (37.8° C.), to which

mustard is added in the proportion of two teaspoonfuls to a gallon of water, and in this he is allowed to remain for about ten minutes. On being taken out he should be wrapped in warm blankets and put to bed, and then dried by means of a warmed towel introduced under the blankets. Hot fomentations or poultices should be put over the larynx, and the steam kettle, if not already in use, set going, and the water medicated with compound tincture of benzoin (1 dr. to 1 pint), fluid extract of lupulin (1 dr. to 1 pint), or a few drops of creosote to the pint. The act of vomiting certainly aids the expulsion of secretions from the larynx, but emetics are objectionable because they often upset the digestion for many days after their use, and so increase the liability to further attacks of croup. Irritation of the back of the pharynx with a finger or feather should therefore be first tried, but if this is unsuccessful and the dyspncea is urgent, 60 drops of ipecacuanha wine on sugar, or 8 to 20 gr. of sulphate of zinc dissolved in milk, may be given.

Bosworth recommends trying to dislodge the inspissated mucus by means of a finger or a sponge attached to a probang. This seems hardly advisable, as with a struggling child the attempt would be very liable to injure the larynx and increase the swelling, so that even if the immediate attack were shortened, the tendency to future attacks would be increased. Very rarely tracheotomy or intubation may be necessary for the relief of the dyspnœa. If the case is urgent and the necessary instruments are not at hand, relief may be obtained by passing a soft gum elastic catheter between the cords into the trachea.

Medicines do not seem to have much effect in cutting short the attack of dyspnœa, but many have been tried from time to time, of which the following may be mentioned :—

Trinitrine	$\frac{1}{1000}$ to $\frac{1}{500}$ gr. = 0.000065 to 0.00013 gm.
Caffeine	1 to 3 gr. = 0.07 to 0.19 gm.
Iodide of sodium	3 to 6 gr. = 0.19 to 0.389 gm.
Bromide of potassium	2 to 5 gr. = 0.134 to 0.32 gm.
Ether	10 to 15 m. = 0.56 to 0.84 c.c.

If the attacks of croup are very frequent or prolonged, some authorities recommend the introduction of a tracheotomy or intubation tube in order to remove the danger of collapse of the lung and broncho-pneumonia; but these operations have their own immediate and subsequent dangers, and it seems wiser to reserve them for cases in which asphyxia is threatened. The

advantages and disadvantages of intubation as compared with tracheotomy are discussed on p. 80.

Preventive Treatment.—Much may be done to prevent the recurrence of acute laryngitis in children, and so to ward off these attacks of paroxysmal dyspnoea. Generally speaking, the same line of treatment as suggested for preventing acute nasal catarrhs (p. 196) should be adopted, but a few points may be especially insisted on.

Proper clothing is most important, and the pernicious habit of dressing infants in clothes with low necks and short sleeves should be avoided. Out-door exercise and attention to diet and all other hygienic conditions are also important ; and above all it is most essential to attend to the upper part of the respiratory tract. Chronic rhinitis should be treated, and adenoids and enlarged tonsils, if present, should be removed. Medicinally cod-liver oil and iodide of iron should be given during the winter months, and in some cases where these disagree, small doses of arsenic will prove useful.

II. ACUTE AFFECTIONS DUE TO GENERAL INFECTIONS

These have already been discussed under the complications of the upper respiratory passages occurring in the course of acute specific fevers (see Chapter iv.).

III. ACUTE INFLAMMATIONS DUE TO LOCAL INFECTION

Inflammatory diseases due to local infection may be classified as follows :—

- (a) Superficial septic laryngitis.
- (b) Submucous or acute oedematous laryngitis.
- (c) Acute septic perichondritis.
- (d) Membranous laryngitis.

A. SUPERFICIAL SEPTIC LARYNGITIS

Definition.—A laryngitis of septic origin, in which the mucous membrane is chiefly or alone affected.

Etiology.—This form of laryngitis is usually associated with insanitary conditions such as a leakage of sewer gas into the house, but it is also met with in hot dry seasons, when there is much dust in the air polluted by various septic micro-organisms. These latter are in all cases the immediate cause of the trouble.

Pathological Changes.—As a rule the inflammatory process affects the whole of the larynx. The mucous membrane is of a dark red colour, resembling raw beef, and has a tendency to dryness. The cords are red and rounded, and occasionally the arytenoids are a little swollen. The pharynx is as a rule similarly affected (p. 422).

Symptoms and Course.—The onset is sudden, commencing with a feeling of malaise followed by a rise of temperature to 100° or 100.5° F., which lasts for a few days, and is accompanied by a feeling of roughness and rawness in the throat. The voice becomes hoarse and sometimes aphonic, and deglutition is a little painful. The symptoms simulate to a great extent those of simple catarrh, but with the great distinction that when the inflammation is septic in origin the patient both looks, and is, worse in health, and the local inflammatory changes are of longer duration, lasting often two, three, or four weeks.

Treatment.—The *general treatment* of the case is important. At the first onset of the disease a purgative dose of calomel (5 to 10 gr.) should be administered, followed by a draught of sulphate of magnesium. When these have acted, large doses of the tincture of perchloride of iron (p. 59) should be commenced, and continued until the inflammation has subsided. A liberal and nutritious diet of liquids, or semi-solids, is indicated, and generally stimulants are of use. If the condition continues, it is very important to make sure that the cause is not persistent. If there is any suspicion of faulty drainage or other insanitary conditions, the patient should be sent from home until all such defects have been remedied.

The *local treatment* must be conducted on the same lines as for acute catarrhal laryngitis (p. 486). A cold compress should be applied to the neck, and tincture of benzoin vapour used every four hours. Later creosote vapour should be substituted, and later still it may be necessary to apply some astringent, such as chloride of zinc, as a paint or spray. The pharynx, which is generally involved, must receive due attention (p. 423).

B. SUBMUCOUS OR ACUTE CEDEMATOUS LARYNGITIS

Definition.—An extremely acute and sometimes fatal septic inflammation of the larynx, characterised by the sudden onset and rapid increase of oedematous swelling of the submucous tissues, which often leads to marked and dangerous dyspnoea.

It may occur primarily in the larynx, but is more often secondary to some septic condition of the neighbouring parts. Out of 190 cases collected by Sestier, 36 were primary and 122 secondary. Amongst the septic conditions which may spread to the larynx may be mentioned septic tonsillitis, phlegmon of the pharynx, angina Ludovici, abscess in the neck, severe septic glossitis and stomatitis, and in rare instances suppurative troubles about the teeth. The probable pathological identity of acute septic laryngitis with phlegmon of the pharynx, angina Ludovici, &c., has already been discussed (p. 419).

Etiology.—The exciting cause is always infection with pyogenic organisms, though apparently it is not invariably due to the same variety of organism. The streptococcus pyogenes is most frequently associated with this disease, but the staphylococcus aureus, the bacillus coli communis, and various other micrococci have also been found. Biondi, Hajek, and others report cases in which they have found the streptococcus erysipelatosus, but the probable identity of this bacillus with the streptococcus pyogenes has already been pointed out (p. 419).

Predisposing Causes.—This disease more often attacks males than females; it is rare in childhood and old age and commonest between twenty and thirty years. Amongst other predisposing causes may be mentioned debility, especially that associated with diabetes, chronic alcoholism, acute specific fevers, and exposure to cold.

Pathological Changes.—The signs of acute inflammation accompanied by marked inflammatory oedema are the characteristic pathological changes. The parts affected at first appear red, swollen, and semi-translucent, and soon become enormously swollen. The whole larynx may be involved, but more often the disease is limited to one area or more, such as to the epiglottis or aryteno-epiglottic folds, and occasionally to the arytenoids, the ventricular bands, or subglottic region. The upper parts are most commonly affected when the disease is secondary to septic conditions in the mouth or pharynx, or to angina Ludovici. If

the epiglottis is affected it swells up very rapidly, and is seen as a red mass overhanging the larynx. If the aryteno-epiglottidean folds are involved, they sometimes assume the shape of two large sausage-like masses, passing from above downwards on either side of the larynx. If the arytenoids and ventricular bands are affected, they seriously encroach upon the lumen of the larynx and hide the cords. If subglottic oedema occurs, a bulging mass can be seen below each cord, which may almost meet in the middle line.

Occasionally an abscess may form, in which case the swelling gradually localises itself, and its centre becomes yellow from the underlying pus. In other instances the intensity of the inflammation may lead to the formation and separation of large sloughs. More or less scarring and deformity with permanent stenosis of the passage may follow either of these developments.

Symptoms and Course.—The symptoms vary with the intensity of the inflammation and the region or regions affected. In most cases there is a sudden onset of sore throat and a feeling of general illness; the temperature rises and, though it does not as a rule exceed 100° or 101° F., it may quickly run up to 103° or 104° F. The patient is conscious of a lump in the throat, which he endeavours in vain to hawk up or swallow. If the epiglottis is affected there may be dysphagia, and if the glottic region is involved there may be some dyspnoea; but in mild localised cases no further symptoms develop, and the oedema quickly subsides with treatment. In severer cases there may be more marked dysphagia, dyspnoea, or loss of voice, according to the region involved, and the patient's general condition may be serious. All the symptoms tend to get rapidly worse for the first thirty-six hours, and the breathing becomes sufficiently embarrassed to suggest the necessity of tracheotomy, when suddenly the progress of the disease becomes arrested, and the condition of the patient remains stationary for from twelve to twenty-four hours, after which a gradual improvement takes place. The breathing becomes freer, the general condition improves, the pain and uneasiness about the larynx diminish, and finally the patient makes a good recovery.

In other instances, after the acute symptoms have ceased, the patient begins to complain of increased pain, and there is a further rise of temperature. This generally means that the disease has limited itself and resulted in a localised abscess.

Lastly, in cases of very severe and wide-spread infection, great weakness and prostration and even signs of cardiac failure develop early in the course of the disease, and the dyspnoea soon becomes distressing. The patient presents an anxious expression, is restless and flushed, and every now and then most alarming attacks of suffocation occur, any one of which may end fatally unless tracheotomy is promptly performed. Even though the dyspnoea is relieved by surgical means, the general weakness may progress and the patient die of cardiac failure within four days of the commencement of the disease, or somewhat later from general septicæmia, pneumonia, or other lung complications.

Diagnosis.—The sudden onset, the rapid course, the extensive oedema, the signs of acute inflammation, and the gravity of the patient's general condition, usually make the diagnosis clear. It must, however, be remembered that great oedema may result from impacted foreign bodies, from injuries to the mucous membrane due to swallowing boiling water or corrosive liquids, from some external injuries such as blows or crushes, and that it may be secondary to syphilis, tubercle, and cancer, or to all forms of perichondritis.

In acute oedema due to injuries the history is always clear, and in the more chronic forms secondary to pre-existing disease the oedema is more localised and the swollen parts are less acutely inflamed. A passive oedema may also occur in the course of heart or kidney disease (p. 180).

Prognosis.—In the severer cases the prognosis is always grave. The patient may die from suffocation, or, if this be avoided, he is very liable to succumb later to cardiac failure, asthenia, or pulmonary complications. When the disease arrests itself within the first thirty-six hours, the chances of recovery are better. If an abscess forms or sloughing occurs, it is possible that a permanent tracheotomy tube may be necessary for relief of the resulting stenosis.

Treatment.—General and local treatment are called for. As regards the general treatment the most important indication is to support the patient's strength, which must be done by freely giving milk, eggs, broth, beef tea, milk pudding, bread and milk; and if swallowing becomes painful and limits the patient's capabilities of taking food by the mouth, rectal feeding should be added. Stimulants such as brandy or whisky, well diluted with milk, must be given freely and frequently. Medicinally, after an

initial purgative (calomel, 5 gr.) the best drug is the tincture of perchloride of iron given in doses of 30 or 40 minims every four hours. Occasionally the addition of five grains of sulphate of quinine seems to exercise some controlling influence over the course of the disease. Should the pulse get feeble strychnine and digitalis should be added to the mixture, or given subcutaneously. In the wide-spread and severe infections the anti-streptococccic serum should certainly be tried. If the lungs become involved, the early and frequent use of inhalations of oxygen has been found useful, and is recommended by Semon. Salicylate of ammonium in doses of 20 gr. every three hours has also been given with beneficial results. If there are severe recurring attacks of dyspncea, large and frequent doses of bromide of potassium are valuable, especially for children, in whom the necessity for tracheotomy may be thus averted. As a means of reducing the oedema the hypodermic injection of pilocarpine, in doses of $\frac{1}{2}$ gr. repeated frequently, has been strongly recommended, but in a disease of such a severely asthenic type it seems most unadvisable to use such a strongly depressing remedy, and therefore local measures for reducing the swelling should be adopted.

Local Treatment.—When the disease is secondary, it is, of course, of the utmost importance to treat in the first place the primary seat of infection. The pus should be evacuated from a tonsillar or peri-tonsillar abscess, or if angina Ludovici is the cause, a free and deep median incision should be made in the neck, and any other buccal or pharyngeal septic affection appropriately dealt with. Prompt measures must, at the same time, be taken to arrest the laryngitis. When first seen four or five leeches should be applied over the thyroid, and the bleeding encouraged for a time by warm boric fomentations. When the bleeding has ceased an ice-bag or Leiter's tubes should be applied to the neck, and small pieces of ice constantly kept in the mouth. If the oedema increases, and causes serious dyspnoea, scarification should be practised. The larynx is lightly cocainised (p. 65), and three or four definite incisions $\frac{1}{2}$ inch long and $\frac{1}{6}$ inch deep are made into the most swollen parts by means of a Mackenzie's concealed lancet or a Heryng's knife, with the aid of a good illumination and a laryngoscope. It must be remembered that there is always great obstruction before this operation is undertaken, and that if blood trickles into the larynx the obstruction may become almost complete and necessitate instant tracheotomy, the means for doing which should always

be at hand. To minimise this danger the incisions must be so planned that the blood will flow away from the larynx ; for instance, they should be made on the glossal surface of the epiglottis, the outer sides of the aryteno-epiglottidean folds, and on the posterior surfaces of the arytenoids, as occasion requires. It is not advisable, as some surgeons recommend, to make incisions guided by a finger introduced through the mouth. After the incisions have been made steam and hot gargles should be used in order to encourage the bleeding and exudation and thus help to reduce the swelling. In many cases the scarification will relieve the dyspnoea, but if it fail to do so, or does so only temporarily, then tracheotomy must be performed. It is always difficult to decide the exact moment when the trachea should be opened, but here, as in other diseases, it is much better to do it early rather than to wait till the patient seems moribund. If there is time low tracheotomy is preferable, as in many cases the oedema extends to the trachea, but if the case is urgent the high operation must be done to save time. The details of this operation are described in Chapter iii. p. 77. Should pus form, it must be evacuated directly it can be localised. The larynx is cocainised, Mackenzie's or Heryng's knife (Figs. 97 and 77) introduced, guided by the laryngoscope, and a free incision made. The knife is quickly withdrawn, and the patient's head and body then bent forward and downward so as to prevent the pus from either blocking the larynx or descending into the lungs.

The above is the routine treatment generally adopted, but other methods have been recommended. For instance, instead of sucking ice some surgeons prescribe steam inhalations, and especially the vapour of compound tincture of benzoin (p. 52). If this is used, its results must be carefully watched, as in some cases the warmth and moisture tend to increase the oedema. Again in place of, or before, scarification, De Havilland Hall recommends the careful application of a 20 per cent. solution of cocaine, after which he has found respiration rendered comparatively easy. If after half-an-hour no relief is obtained, he then proceeds to scarification.

Intubation is practised by some surgeons in place of tracheotomy. The latter, however, is the easier operation, as owing to the swollen and irritable condition of the parts it is by no means easy to manipulate a tube into the larynx, or to keep it there even if successfully introduced (p. 80). If the case is urgent, there-

fore, tracheotomy is the safer and surer proceeding. MacEwen tided a patient over his difficulties by introducing a soft rubber catheter.

Lennox Browne states that even after all oedema of the larynx has subsided tracheotomy may be required, owing to paralysis of the abductors having occurred from extensive infiltration of the muscles.

C. ACUTE SEPTIC PERICHONDRITIS

Definition.—An acute inflammation of the perichondrium, of septic origin, which, unless quickly arrested, leads to the formation of pus and is followed by necrosis of cartilage.

Etiology.—As the name and definition suggest, this form of perichondritis is always due to infection of the perichondrium with pyogenic organisms. It is due to precisely the same organisms as are found in acute oedematous laryngitis, and other septic conditions of the pharynx, larynx, and neck, of which the streptococcus pyogenes is much the most common (pp. 419, 494). The organism may reach the perichondrium of the laryngeal cartilages either by the blood or lymph streams, or through an abraded or injured mucous membrane. The following are recognised causes of infection :—

(1) *Specific Fevers and General Infections*, such as typhoid, typhus, variola, diphtheria, erysipelas, pyæmia, and pneumonia.

(2) *Trauma*, such as caused by cut throat, gunshot wounds, the passage of cesophageal bougies, the retention of a hard feeding-tube, and strain due to sudden and violent vocal efforts. Injury to the cricoid may also occur from pressure against the vertebrae in cases of lordosis, or in old people, especially if the cartilage is ossified, or in invalids who are confined to bed on their backs for long periods. It may also be due to the swallowing of foreign bodies, or even of unmasticated food.

(3) *Extension from Neighbouring Parts*, such as from an abscess in the neck.

(4) *Exposure to Cold*.—Many cases occur after prolonged exposure to cold, and this at one time was thought to be the chief exciting cause of acute perichondritis. Exposure, however, predisposes the patient to septic infection by lowering his resisting powers.

Pathological Changes.—As a rule only one cartilage is attacked, though in very severe cases all the cartilages may suffer simul-

taneously. The cricoid being more exposed to injury than the other cartilages is most frequently affected, whilst comparatively speaking the thyroid and arytenoids are rarely involved.

The chief changes observed are redness, swelling, and oedema of the part affected, generally accompanied by marked weakness of movements. When the cricoid is affected the swelling will be seen to involve the ary-epiglottic folds, the posterior wall of the larynx, the external surface of the larynx towards the pyriform fossa, or the subglottic region, according to the particular portion of the cartilage affected. If the thyroid is affected on its inner surface the swelling is generally seen below the anterior commissure, extending backwards beneath the cords, and in bad cases the ventricular bands are pushed upwards and inwards towards the middle line. If the external plate is affected, there will be swelling and sometimes redness over the thyroid cartilage in the neck. If one of the arytenoids is attacked it becomes greatly swollen and oedematous, and the crico-arytenoid joint quickly becomes fixed. The inflammatory process may, in rare instances, become arrested and resolution occur, but more often the infiltrated tissues break down, and an abscess forms, in which case the centre of the red swelling will become tinged with yellow. Unless opened by surgical means the abscess will sooner or later burst, leaving a discharging sinus through which, if it is possible to pass a probe, bare o: necrosed cartilage can be felt. Later, when exfoliation is taking place, larger or smaller pieces of necrosed cartilage may be seen extruding above the surface of the mucous membrane, or sometimes lying loose in the larynx. When all the necrosed cartilage has separated great deformity of the larynx will frequently result, due partly to collapse of the soft structures, partly to inflammatory adhesion, and partly to cicatricial contractions. The resulting deformity is generally sufficient to cause more or less stenosis.

Symptoms and Course.—The onset of the disease is sudden, and is marked by chilliness and sometimes a rigor, by loss of appetite, furred tongue, aching of limbs, and a small rise of temperature (100° to 101° F.). The patient soon presents the appearances of one seriously ill, and considerable weakness is an early symptom. A deep boring pain is felt in the throat, and there is definite tenderness over the larynx. Cough, hoarseness, aphonia, dysphagia, and dyspnoea soon follow, varying in degree according to the exact position and extent of the perichondritis. Dysphagia is more marked when the posterior surface of the cricoid or one of the

arytenoids is affected, and rapidly increasing dyspnoea when the internal plates of the thyroid are involved. The voice may be affected by mechanical interference with the approximation of the cords, by fixation of the crico-arytenoid joints, by infiltration of the muscles, and by subglottic swelling. If the external surface of the thyroid is attacked there is swelling, pain and tenderness, and later on redness and fluctuation over the thyroid in the neck. Necrosis of the thyroid is less common than of the cricoid, as the blood supply to the former is freer. When suppuration and necrosis occur the patient's condition generally becomes very grave. His temperature follows the usual septic course, his appetite is poor, there is increased difficulty in swallowing, and he becomes gradually weaker and weaker, and unless nature or surgery rid him of the necrosed portions of cartilage, he may succumb to the continuous drain upon his resources. Septic pneumonia is not uncommon owing to pus or necrotic tissue finding its way to the lungs, and mediastinal abscess may occur from pus burrowing beneath the deep fascia of the neck. Finally, if the patient survive, more or less stenosis of the larynx is common, which may necessitate a permanent tracheotomy tube or thyrotomy.

Diagnosis.—Acute septic perichondritis may be confounded with acute oedematous laryngitis, and with oedema or perichondritis secondary to syphilis, tubercle, or cancer. It is generally more localised than acute oedematous laryngitis, and the deep-seated boring pain with tenderness on pressure over the larynx will help in diagnosis. In secondary perichondritis the general symptoms are not so acute, and usually some definite signs of the primary disease can be discovered.

Prognosis.—This can hardly be considered favourable. Death may occur from dyspnoea or exhaustion either in the earlier or later stages of the trouble. If the patient survive, permanent damage to the voice and more or less difficulty in breathing must be expected.

Treatment.—The treatment will vary with the stage of the disease.

In the earliest stage it may be possible to arrest the progress of the disease by prompt measures. The patient should be put to bed at once in a warm room and five grains of calomel must be given, followed next morning by two ounces of white mixture (p. 59). The diet must be liberal, and should consist of fluids or semi-solids. Locally, four or five leeches should be applied to the

neck over the larynx, followed by the application of an ice-bag or Leiter's tubes, and small pieces of ice should be constantly sucked. As complete rest as possible should be obtained for the parts by keeping the patient absolutely quiet in bed, and prohibiting all talking or even whispering. Internally the tincture of perchloride of iron is given in doses of 30 to 40 minims every four hours, and injections of anti-streptococcal serum may be tried. One minim of tincture of aconite every hour, or ten minims of wine of antimony every four hours, have been recommended, but are objectionable on account of their depressing action.

If the disease is established when the patient is first seen, and marked swelling and oedema have developed in the larynx, the above treatment should nevertheless be promptly carried out, whilst locally a deep incision must be made in the neck over the thyroid and cricoid cartilages, especially if there is any external swelling. A general anaesthetic should be avoided if possible, but the skin may be frozen with ethyl chloride. If there is much dyspnoea, tracheotomy instruments must be in readiness. If there is redness or swelling the incision is made through its centre down to the cartilage, but otherwise it should be made in the middle line, and afterwards kept open by the insertion of a small piece of gauze. If pus is evacuated immediate relief usually follows this procedure, and even if no pus is found much benefit will result.

Medicinally, in addition to iron, iodide of potassium in fifteen-grain doses three times a day may be strongly recommended at this stage of the disease. They may be combined conveniently in the following mixture :—

R.	Iodide of potassium	15 gr. = 1.03 gm.
	Carbonate of ammonia	3 gr. = 0.21 gm.
	Citrate of iron and ammonia	10 gr. = 0.69 gm.
	Glycerin	10 m. = 0.62 c.c.
	Water.	to 1 oz. = 30 c.c.

If serious dyspnoea occur in spite of this treatment, other methods must be tried. The larynx should be painted with a 20 per cent. solution of cocaine in the hope of reducing the swelling, but if in the course of twenty minutes there is no relief, the swollen parts should be incised as directed for acute oedematous laryngitis ; and if this is not efficacious tracheotomy must be performed. If the disease is localised and an abscess threaten, suppuration should be encouraged by steam inhalations and by the application of boracic poultices to the neck. Directly it seems probable that

an abscess has formed the larynx must be cocainised (p. 65) and a free incision must be made with an intra-laryngeal knife (p. 497) to evacuate the pus. The swelling may then quickly subside, and the necessity for tracheotomy be averted.

In the course of acute perichondritis dyspncea necessitating tracheotomy may also arise from (1) impaction of a sequestrum, (2) fixation of both cords in the middle line, (3) contractions and adhesions following cicatrisation, or (4) collapse of the walls of the larynx following extensive loss of cartilage. The high operation or even laryngotomy should be performed in all cases where the cause of the obstruction is supraglottic, as the opening may be of assistance later in removing pieces of necrosed cartilage, but if there is subglottic swelling the low operation may be necessary. (For methods, see pp. 75 to 80.)

When a sequestrum has formed special measures must be taken for its prompt removal. If it separates, it may, as just stated, become impacted at any moment and give rise to dangerous and even fatal dyspnoea. If it remain fixed it will eventually add to the cicatrical contraction by increasing the inflammatory infiltration, whilst continued suppuration may wear out the patient. When possible the sequestrum should be removed through the mouth with laryngeal forceps under local anaesthesia. Thyrotomy, however, is indicated (1) when the sequestrum, though loose, cannot be removed through the mouth, (2) when the necrosed cartilage does not quickly separate and come to the surface spontaneously, (3) when there is a discharging sinus either internally or externally, at the bottom of which a sequestrum can be felt with a probe, (4) when the patient is becoming exhausted by slow septic poisoning.

The method of performing thyrotomy has already been described (p. 82). When the larynx has been opened its interior should be carefully explored for sinuses, discharging abscess cavities, and necrosed cartilage. Sinuses and abscess cavities should be opened up, thoroughly curetted, and packed with iodoform gauze, and every fragment of necrosed cartilage removed, but great care must be taken not to remove any healthy cartilage, for fear of causing unnecessary collapse of the parts and thus increasing the stenosis. Whilst the larynx is open it should be carefully examined for cicatrical adhesions and contractions, and if any are found they should be divided or removed. When the sinus opens externally in the neck, the outer plate of the affected

cartilage is often alone necrosed, and it may then be possible to cut down and remove the diseased portion without opening the larynx. Where feasible this should certainly be done.

These operations, as a rule, will save the patient much distress and depreciation of health by cutting short the suppuration, but unfortunately they do not appreciably lessen the risks of contraction and stenosis, and in spite of them the permanent wearing of a tracheotomy tube may be necessary.

Treatment of Subsequent Stenosis.—Stenosis due to cicatricial contraction, adhesions, or fixation of the cords in the middle line may commence at an early stage of perichondritis, but the maximum amount cannot be determined until some time after healing is complete, and consequently tracheotomy may become necessary quite late in the course of the disease. As regards the treatment for the permanent relief of the stenosis, tracheotomy is certainly the simplest and probably the best method, though, of course, the discomforts and even dangers of a permanent tracheotomy tube are very great. Other methods have been advocated, such as the use of Schroetter's bougies, intubation, and thyrotomy with dissection of the cicatricial bands and adhesions. Schroetter's bougies have been accorded much praise by some experts, especially on the Continent. Their use, however, is very distressing to the patient and has to be continued for a very long time, and even then the results are not markedly successful. The same may be said of intubation. As regards thyrotomy performed for the relief of stenosis, the results have not so far been very satisfactory, and the after-treatment is long and tedious. If, however, it has been deemed advisable to perform thyrotomy for the opening up of sinuses and the removal of sequestra, an attempt should certainly be made to remedy the stenosis, if it then exist, by dividing adhesions and dissecting away contracting bands, and afterwards endeavouring to keep the parts patent by means of a metal plug passed into the larynx through a special tracheotomy tube. This plug should be worn for many months. For further details for the relief of stenosis, see *Syphilis*, p. 164.

D. MEMBRANOUS LARYNGITIS

Definition.—A severe inflammation of the larynx characterised by the formation of a fibrinous membrane.

As a rule, the larynx is affected secondarily to the pharynx,

though the laryngeal condition may be far more extensive and serious than the pharyngeal. Primary membranous laryngitis may however occur.

Etiology.—Exciting Causes.—The exciting cause of this disease has for long been the subject of dispute. There are some who do not recognise membranous laryngitis apart from diphtheria, whilst others maintain that a non-diphtheritic form does certainly occur. Recent investigations point to the latter view as being the correct one. It may be said that the occurrence of acute membranous laryngitis is due to some poison of an intensely irritating nature, and, when not diphtheritic in origin, it is due to the presence of virulent streptococci or to powerful chemical irritants. In short, several poisons may cause it, but much the most common of all is that of diphtheria.

Predisposing Causes.—As in other acute diseases of the larynx, exposure to cold seems to exercise some influence in determining an attack of membranous laryngitis, probably by diminishing the resisting power of the individual. It occurs most frequently in children under nine years of age, and is often associated with some of the acute specific fevers (Chapter iv.), or with acute oedematous laryngitis. In some cases it is secondary to injury due to inhalation of steam or swallowing corrosive liquids such as carbolic acid.

Pathological Changes.—As the disease almost invariably occurs in infancy or early childhood, it is generally very difficult or even impossible to see the changes which take place in the larynx. If a view can be obtained, or if the case come to the post-mortem table, the mucous membrane will be seen to be red and swollen and to be covered in parts by a yellow or greyish-white membrane. Occasionally the whole larynx is so covered, and the membrane may extend down the trachea and even to the bronchi. Generally some evidence of disease can be found in the pharynx.

Symptoms and Course.—The disease is ushered in by chills, and occasionally a rigor, accompanied by the usual feeling of illness and a rise of temperature. If the case be one of diphtheria this does not often exceed 100° or 101° F., but in cases due to streptococci it may rise to 103° or 104° F. A sensation of dryness, a certain amount of pain and discomfort in the throat, and a little dysphagia occur, whilst the voice becomes hoarse, metallic, and later aphonic. Dyspnoea is a constant symptom: it commences within twenty-four hours of the onset of the disease, gradually increases, and may become alarming towards the end of the second

or commencement of the third day. If then unrelieved by arrest of the disease or expulsion of the membrane, death may occur from asphyxia unless tracheotomy or intubation be performed. Cardiac failure is often an early and marked symptom, and sometimes the immediate cause of death, especially in diphtheritic cases. Finally, the membranous exudation may spread to the lungs or septic pneumonia result, either of which complications add greatly to the gravity of the case.

Diagnosis.—Great difficulty may often arise in distinguishing between membranous laryngitis and severe simple catarrhal laryngitis in children. The symptoms often resemble each other almost exactly, even to the occurrence of grave dyspncea. This, however, in membranous laryngitis tends to be continuously progressive with occasional acute exacerbations, whereas in acute catarrhal laryngitis it is fitful and often spasmodic, with intervals of almost complete freedom, and the bad attacks of dyspncea almost always occur only at night (p. 489).

Prognosis.—This is always grave, death being liable to result from suffocation, from extension of the disease to the lungs, or from asthenia. Seeing that the majority of cases are due to the Klebs-Loeffler bacillus, the prognosis has been considerably improved by the introduction of the anti-diphtheritic serum.

Treatment.—General.—In every case where membranous laryngitis is diagnosed, diphtheria antitoxin should be employed at once. (For method of injection, see p. 94.) Its success in arresting the disease depends entirely on the promptitude of its administration. If, later, bacteriological examination shows that the infection is streptococcal, the anti-streptococcus serum may be injected. Medicinally a purgative dose of calomel or mercury with chalk should be at once given, followed by large doses of Tinctura Ferri Perchloridi (from 10 to 40 m., according to the age of the patient), to which small doses of strychnine or digitalis may be added if there is much cardiac or general weakness. The patient must be kept quite quiet in bed, the nourishment should be soft, stimulating, and plentiful, and alcohol should be given if the pulse indicates any necessity.

Mercury has obtained a good reputation for checking the formation of the membrane. It may be given either in the form of calomel or grey powder in full doses. For a child of five years two grains of either can be given every two hours for twenty-four hours, or until free purgation is established, and then less frequently.

It is best administered suspended in milk, but if the child is unmanageable it may be blown on to the back of the tongue. Seeing, however, that a very large majority of cases of membranous laryngitis are diphtheria, and that antitoxin is the best method of controlling the membranous exudation, mercury, except in a purgative dose at the commencement of treatment, cannot claim the position it formerly held, especially as it is a depressing drug and the disease itself is of a markedly asthenic type. Emetics are useful if the membrane has loosened, but they are weakening and must therefore be used with caution.

Treatment.—Local.—Steam is useful in helping to detach the membrane, and so possibly in minimising the dyspnoea. The usual method of putting the patient into a tent into which one or two kettles are allowed to vent steam is the best. The steam may be advantageously medicated with compound tincture of benzoin by adding a teaspoonful of the drug to each pint of water. Bosworth lays great stress on the advantage of generating steam by slaking lime, in addition to the steam kettles. He advises that this should be done every four to six hours. He thinks small particles of lime are carried to the larynx and exercise a beneficial local action. Pilocarpine, in doses $\frac{1}{20}$ gr. for a child of five, has been advocated with the object of loosening the membrane, but it cannot be recommended owing to its depressing action.

Should the dyspnoea increase in spite of the above general and local treatment, and the breathing become seriously impaired, intubation or tracheotomy should be performed at once. Surgical relief should never be delayed until the child's general condition has become really grave. It is better to operate unnecessarily, rather than too late. Speaking generally, tracheotomy is to be preferred to intubation, owing to the risks of injuring the inflamed mucous membrane with the intubation tube, and of pushing the membrane before it, thus failing to relieve the dyspnoea, but for a full statement of the advantages and disadvantages of the two operations and the methods of carrying them out, see pp. 77 to 82.

IV. ACUTE TRAUMATIC LARYNGITIS

Etiology.—Traumatic laryngitis may be due to the following causes :—

- (1) The inhalation of steam from a boiling kettle.

- (2) The inhalation of irritating gases or fumes.
- (3) Swallowing corrosive fluids, such as pure carbolic acid.
- (4) Wounds of the larynx due to swallowing hard, pointed, or cutting substances.
- (5) The presence of a foreign body.
- (6) Sudden and violent vocal strain.
- (7) The application of caustics to the larynx.
- (8) External injuries, such as cut throat, blows, strangling, &c.

Pathological Changes.—In mild cases the pathological appearances are precisely the same as in simple catarrhal laryngitis (p. 485). When the injury is severe, especially when it results from an attempt to drink from the spout of a boiling kettle, great oedema may supervene in the course of an hour or two. The epiglottis becomes much swollen and may quite hide the lower parts of the larynx, but the arytenoids and ventricular bands, if seen, will appear swollen, red, and semi-translucent, and the cords thick and rounded. The oedema may be sufficient to render the lumen of the larynx extremely and often dangerously small. Finally, suppuration may occur and lead to the formation of an abscess, and, when the injury is due to the swallowing of corrosive liquids, extensive gangrenous sloughing may take place.

Symptoms.—As a rule the symptoms, like the pathological changes, resemble those of simple acute laryngitis, but in cases of severer injury they are practically those of acute septic laryngitis. In these latter cases the dyspnoea is the most important symptom and often increases so rapidly that a hurried tracheotomy becomes necessary. If suppuration occurs there may be marked rise of temperature, pain, and tenderness over the larynx, and considerable general disturbance.

Diagnosis.—The history of the case and the pathological appearances will generally be sufficient evidence on which to establish a diagnosis.

Prognosis.—In slight cases the prognosis is in every way good. In severe oedematous cases there is grave danger to life, either through suffocation or through exhaustion due to sloughing and suppuration. If life is preserved there are considerable risks of troublesome stenosis of the larynx and damage to the voice.

Treatment.—In mild cases the treatment is precisely the same as for catarrhal laryngitis (p. 486), and in severer cases where oedema occurs it is much the same as in acute oedematous laryngitis (p. 496).

The sucking of ice very often gives greater relief and more quickly checks the œdema than do hot inhalations. Tracheotomy may at any moment become urgently necessary, especially in children in whom spasm of the glottis is liable to occur, and everything, therefore, should be kept in readiness for its performance. If suppuration takes place and a collection of pus forms, a free incision should be made (p. 498). If due to the presence of a foreign body steps must be taken at once to remove it (p. 592). For the treatment of fracture and cut throat, see pp. 588-590.

CHAPTER XXIII

CHRONIC INFLAMMATORY AFFECTIONS

I. CHRONIC HYPERPLASTIC LARYNGITIS: General Etiology and Treatment.
A. *Simple Chronic Catarrhal Laryngitis*.—B. *Singer's Nodes*.—C. *Pachydermia Laryngis*.—D. *Hæmorrhagic Swellings*.—E. *Chronic Subglottic Laryngitis*. II. LARYNGITIS SICCA: Varieties and Treatment. III. CHRONIC PERICHONDRTIS: Etiology and Treatment. IV. ANKYLOSIS OF THE CRICO-ARYTENOID JOINT.

IN this chapter the following chronic inflammatory affections will be considered:—

- I. Chronic Hyperplastic Laryngitis, with its many sub-varieties.
- II. Laryngitis Sicca.
- III. Chronic Perichondritis.
- IV. Chronic Arthritis.

I. CHRONIC HYPERPLASTIC LARYNGITIS

In the course of chronic hyperplastic laryngitis special tissues or localities may be picked out by or bear the chief brunt of the inflammatory process, consequently the clinical appearances are very varied. As a result of this many of the chief types of chronic laryngitis have received special names, which for the purposes of description are here retained, though they are all the result of one process. The following clinical conditions will be specially alluded to:—

- (1) Simple Chronic Catarrhal Laryngitis.
- (2) Singer's Nodes or Corditis Tuberosa.
- (3) Pachydermia Laryngis.
- (4) Hæmorrhagic Swellings.
- (5) Chronic Subglottic Laryngitis.

The etiology, symptoms, diagnosis, prognosis, and general treatment common to all forms of chronic laryngitis will be first described, and then the special features of these various types will be considered in detail.

Etiology.—Repeated attacks of acute laryngitis, especially if

severe or neglected, are the commonest cause of chronic catarrhal laryngitis. Other causes divide themselves into four main groups, the recognition of which is useful in treatment, both curative and preventive.

(1) *Affections of the Nose, Naso-pharynx, and Pharynx*.—In a great number of cases of chronic laryngitis there is either catarrh of the nose and naso-pharynx or nasal stenosis; and the consequent mouth breathing or irritating discharges render it useless to treat the larynx without also attending to the defects higher up. In many cases the larynx will get well without direct treatment if the nose and naso-pharynx can be rendered healthy and physiologically active.

(2) *Over-use of the Voice*, combined with a faulty or forced production.

(3) *Direct Irritation*.—This is generally associated with the long-continued inhalation of dust, smoke, or fume-laden air, and is, therefore, usually found amongst sawyers, millers, chemical workers, and ivory-turners. The excessive use of tobacco, especially if strong, may also act as a direct irritant.

(4) *Digestive and General Disorders*.—Chronic laryngitis is common in people suffering from gastric troubles, especially if due to excess of alcohol; and these affections may be considered causative in so far as the larynx will not yield to treatment until they are rectified. Other cases are associated with gout and rheumatism, and others again with anaemia. An obstinate form is also common in people who have had syphilis. This is not laryngeal syphilis, but a catarrhal laryngitis occurring in a syphilitic subject. Finally, it is not uncommon in people suffering from tuberculosis of the lungs.

Chronic laryngitis is commoner in males than in females, and occurs more frequently in adult life, though it is not at all uncommon in youths at the age of puberty, and is then responsible for the cracking or breaking of the voice, which often persists for a prolonged period, unless the inflammatory condition on which it depends is successfully treated.

Symptoms.—The chief symptom of chronic laryngitis is *alteration of the voice*. In mild cases this may be very slight, except during vocal efforts such as public speaking or singing, when the voice is found to be uncertain, difficult of control, and slightly hoarse. In singers the top notes may be lost or the voice may crack unexpectedly. In severer cases the ordinary speaking voice

is usually rough, gruff, and hoarse, and the singing voice entirely lost. Another symptom and one which may require special treatment is *cough*. As a rule, it is not much more than hawking; but occasionally most violent and distressing paroxysms may occur, especially in alcoholic subjects, which prevent sleep and considerably undermine the patient's general health. There is not much actual *pain*, but rather aching and a feeling of fatigue, especially after use of the voice. Singers commonly state that after one song they can sing no more owing to the aching of the throat. Rheumatic subjects, however, often complain of great pain shooting down the neck.

The secretions are usually muco-purulent, sticky, and scanty. Occasionally there may be a copious secretion, which seems to be induced by any effort at vocalisation. Singers, for example, may be wholly stopped by it the moment they commence to sing. This condition has been called laryngorrhœa. There may be slight *dyspnoea* from the formation of crusts in a larynx already narrowed by hypertrophic swellings.

Diagnosis.—As a rule, there is no difficulty in determining the diagnosis by careful observation of the pathological changes; but occasionally it may be difficult to exclude tuberculosis, syphilis, and cancer, especially in unilateral cases. Examination of the chest and sputum, and the removal of a portion of the thickened tissue for microscopic investigation, are sometimes necessary before a definite diagnosis can be made.

Prognosis.—Chronic laryngitis is free from danger, but its existence renders the patient more liable to acute septic infections of the larynx and to local complications in chronic infective diseases, such as tuberculosis and syphilis. The disease itself tends to remain stationary, and though very obstinate to treatment a recovery may eventually be anticipated except in advanced cases of pachydermia.

It has been much debated whether chronic laryngitis ever leads to new growths either simple or malignant. There seems to be some evidence that it predisposes to simple papillomata or fibromata, but less to show that it is a cause of malignant disease.

Cancer of the vocal cords, however, is of sufficient frequency amongst those who use the voice professionally to suggest that there may be some connection between its occurrence and the chronic laryngitis which may result from over-use of the voice.

General Treatment.—This will depend to a great extent upon the underlying cause of the laryngitis. If it is due to frequent attacks of acute laryngitis, the preventive measures discussed under acute catarrhal rhinitis must be enforced (p. 196). If due to direct local irritation, change of occupation or residence and the prohibition of smoking may be advisable and sometimes necessary. If due to over-use of the voice combined with a faulty production, it is of the utmost importance that the voice should be rested for the time being and, when the local condition has been relieved, that the patient should obtain thoroughly good lessons in singing or voice production before using the voice again. If the laryngitis is secondary to disease or deformities of the nose or naso-pharynx, these conditions must be promptly treated; for, as already pointed out, treatment of the larynx can only afford very temporary benefit as long as such abnormalities exist. If associated with visceral or diathetic disorders, treatment appropriate to such conditions is most important, and should be carried out concurrently with local treatment. The patient must be carefully dieted, and alcohol prohibited, especially when there is history of its over-use. If in rheumatic subjects the laryngitis is accompanied by much pain, three grains of salicylate of quinine in the form of a pill three times a day after food will prove beneficial, or as an alternative ten grains of aspirin three times a day may be tried. If the patient is anæmic, appropriate remedies must be employed, and if there are any evidences of pulmonary tuberculosis, the treatment suggested in Chapter v. p. 106 must be carried out, and the larynx carefully watched for signs of infection.

In all cases the patient should avoid as far as possible sedentary habits and insanitary surroundings. Fresh air and regular exercise are important, and if the case prove obstinate, change of air to some place with a warm, dry, and equable climate may be useful. In the case of patients to whom it is of great importance to get well quickly, residence and treatment at a watering-place, such as Ems or Mont Dore, will hasten a cure, and rest of the voice during treatment is absolutely essential. All singing and public speaking should be entirely prohibited, and in bad cases ordinary talking should be restricted as much as may be. Apart from the special dieting necessary for dyspeptic and gouty patients, food should be as simple and non-irritating as possible. Spices, pickles, and condiments, spirits

and beer, must be avoided, and if for any reason alcohol is indicated, only a light wine should be ordered.

1. Simple Chronic Catarrhal Laryngitis

Pathological Changes.—Hyperæmia and more or less thickening of the mucous membrane are the most important changes. In mild cases the thickening may be so slight as to be hardly noticeable to the naked eye, whilst in severe cases there may be marked hyperplastic swellings. For descriptive purposes, therefore, cases may be divided into two groups, though clinically there is no marked line of distinction between them: (1) slight general thickening of the mucous membrane, and (2) marked hyperplasia of the mucous membrane, often localised and often associated with definite outgrowths.

(1) *Slight General Thickening of the Mucous Membrane.*—Though the condition generally involves the whole larynx, the thickening is always most noticeable in the inter-arytenoid space and on the cords, especially about the vocal processes. In the former situation it is often hardly noticeable during quiet respiration, but on phonation the mucous membrane is thrown into distinct folds, and appears to be deeply fissured. If the cords are affected, they lose their sharp edges and become slightly rounded and uneven, and small abrasions are sometimes seen along their edges. The cords vary in colour from pinky grey to distinctly red and lack their normal lustre, and very often dilated vessels can be distinctly seen, which sometimes are so numerous and large as to have merited the special name of phlebectasis laryngea. (Mackenzie.)

In severe cases of chronic laryngitis the inflammatory infiltration may not limit itself to the mucous membrane, but extends to the muscles, especially to the arytenoideus and the internal tensors. If the latter are involved the cords become bowed in shape on phonation, and do not approximate at their centres. If the arytenoideus is affected a triangular opening is left in the posterior third of the glottis on phonation (pp. 556 and 557). Complete adduction may also be limited mechanically by swelling, especially if the inter-arytenoid fold is much affected. The secretions of the mucous membrane are altered, being muco-purulent, sticky, and scanty, while streaks of mucus may be seen lying on the mucous membrane or stretching across the glottis from one cord to the other. If the inflamma-

tory changes be limited to one cord, it is always possible that some graver trouble may be underlying them, such as tubercle, syphilis, or cancer, especially if there is ulceration. In laryngitis secondary to catarrhal conditions of the nose, Grant describes the mucous membrane as looking macerated, or sodden, swollen, and pale, which appearances he thinks are due to proliferation of the superficial epithelium.

(2) *Marked Hyperplasia*.—This is characterised by great thickening of the mucous membrane. It may affect the whole

larynx, but more often picks out the inter-arytenoid fold or the cords, and sometimes the ventricular bands. The inflammatory infiltration affects the submucous layer chiefly, but sometimes there is also a heaping up and keratinisation of the surface epithelium, showing that no sharp line of distinction can be drawn between the conditions here described and the pachydermatous growths described below.

FIG. 203.—Thickening of the inter-arytenoid fold, due to chronic laryngitis.

When the inter-arytenoid fold is affected it becomes swollen and thickened, sometimes smooth and rounded (Fig. 203), sometimes rough and irregular (Fig. 204). It protrudes into the glottis, and sometimes wart-like growths are seen on the surface of the swelling. The cords become much thickened, rough and rounded, and their movements both in adduction and abduction are considerably hampered. If the ventricular bands are affected they become considerably enlarged and partially or completely hide the cords. Accompanying the thickening there is marked hyperæmia of all the affected parts ; the secretion is muco-purulent and sometimes excessive, in which case it can often be seen lying on the swollen mucous membrane.

Local Treatment.—This consists essentially in the application of stimulants and astringents to the parts affected, after previous treatment of any super-imposed acute or subacute laryngitis by means of soothing applications (p. 486). There are

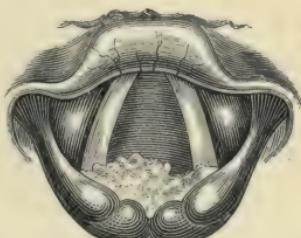
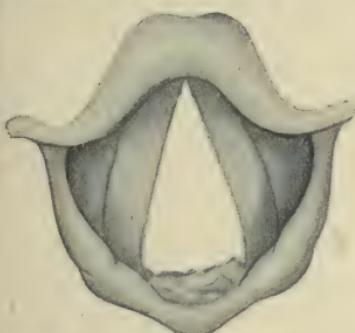


FIG. 204.—Rough irregular thickening of the inter-arytenoid fold, due to chronic laryngitis.

four chief methods of applying the selected remedy to the laryngeal mucous membrane, namely, by the use of inhalations, sprays, insufflations, or paints. Steam inhalations can be used by the patient himself as often as may be desired in his own home, and are free from danger provided the water is not too hot and the patient remains in the house for a short time after their use (p. 51). In some instances dry inhalations answer better (p. 53). Sprays and insufflations can also be used by the patient with a little practice (pp. 51 and 54); but they should occasionally be applied by the surgeon as well. Paints, though perhaps the most useful of local applications, should be used by experts only, since, if not dexterously applied, the brush or wool carrier may cause considerable bruising and irritation of the larynx. In tuberculous subjects they are best avoided, unless the larynx be previously cocainised and the application made with great skill and gentleness, for if the mucous membrane be bruised or abraded it is extremely likely to become infected with the tubercle bacillus. Whichever method and whatever drug is selected at the outset, it must be remembered that in chronic laryngitis the progress towards recovery is always slow and that no one application is likely to continue efficacious for any long period. Quicker progress will be effected if a change is made directly the local condition appears to have come to a stand-still.

The details of treatment will necessarily vary according to the exact pathological changes observed in the larynx. Where there is considerable hyperæmia with slight thickening the patient should use the vapour of tincture of benzoin for the first week, and if there are any signs of nasal or post-nasal catarrh, the alkaline nasal wash. At the end of the week the larynx must be inspected, and, if there be less hyperæmia, it may be painted or sprayed with one of the solutions to be mentioned presently, while the Vapor Pini Silvestris should be substituted for the benzoin vapour for home use. A week or a fortnight later the painting is repeated, and the Vapor Creosoti or Cubebi (p. 53) substituted for the Vapor Pini Sylvestris. From now onwards the case should be conducted by occasional applications of paints, sprays, or powders by the surgeon, and by ringing the changes on the various stimulating inhalations, as long as satisfactory progress is being made.

If the case does not make steady progress under this method of treatment, or if from the first it is of a severer type, as shown

by the greater amount of thickening and impairment of function, local applications must be made by the surgeon more regularly, and at shorter intervals. At first they are made every other day, then twice a week, finally once a week until the condition is so far improved that the patient can continue the treatment himself. Of the various paints which have been recommended the following are the most useful :—

Perchloride of iron	from 60 to 120 gr. to 1 oz.
Chloride of zinc	" 15 " 30 "
Sulphate of copper	" 10 " 20 "
Nitrate of silver	" 20 " 60 "

These same drugs may be used as sprays, but the strength of the solutions should then be very much weaker, as under :—

Perchloride of iron	10 to 20 gr. to 1 oz.
Chloride of zinc	10 " 20 "
Sulphate of copper	5 " 10 "
Nitrate of silver	5 " 10 "

The most useful astringent powder is the *Insufflatio Aluminis*. It should be commenced diluted with three parts of starch, and the strength of alum then gradually increased until the pure drug can be tolerated.

Whichever method is adopted, the patient should use one of the stimulating inhalations, already suggested, night and morning, between the visits to the surgeon.

In severe cases where there is great thickening and hyperplasia stronger remedies will be necessary. Chloride of zinc and nitrate of silver are the most useful applications. To avoid the risk of unpleasant spasm of the glottis they should be commenced in weak solutions, as recommended above, and gradually increased in strength, or the larynx should be previously anæsthetised with cocaine (p. 65). Chloride of zinc may be pushed to 40 or 60 gr. to the oz. and nitrate of silver may be used even stronger. Semon recommends that it should be commenced at the strength of 15 gr. to the oz., and gradually increased to 24, 96, and even 240 gr., according to the necessities of the individual case.

Special Indications.—(1) If there be any great tendency to dryness of the mucous membrane the *Vap. Cubebi* is especially useful, and a mixture containing chloride of ammonium (p. 488) given three times a day will be helpful. If the secretions are very sticky, or tend to dry into crusts, the treatment recom-

mended for the inflammatory forms of laryngitis sicca must be adopted (p. 529).

(2) If the case is secondary to catarrhal rhinitis and the mucous membrane is sodden and macerated, Grant recommends anaesthetising the larynx and carefully applying the following paint by means of a small tampon of cotton wool on a holder:—

R.	Salicylic acid	5 gr. increased to 25 gr. = 0.34 gm. to 1.71 gm.
	Rectified spirit	5 dr. = 18.75 c.c.
	Glycerin	to 1 oz. = 30 c.c.

(3) If there be severe paroxysmal cough, an insufflation of morphia should be applied locally, and one of the following mixtures given internally:—

R.	Dilute hydrocyanic acid	5 m. = 0.31 c.c.
	Etherial tincture of lobelia	15 m. = 0.94 c.c.
	Iodide of potassium	3 gr. = 0.21 gm.
	Bicarbonate of potassium	5 gr. = 0.34 gm.
	Aromatic spirits of ammonia	20 m. = 1.25 c.c.
	Camphor water	to 1 oz. = 30 c.c.
R.	Hydrochloride of heroine	1/2 gr. = 0.005 gm.
	Aromatic sulphuric acid	10 m. = 0.62 c.c.
	Glycerin	10 m. = 0.62 c.c.
	Chloroform water	2 dr. = 7.5 c.c.

Or the following pill given three times a day will often prove useful:—

R.	Codeine	1/2 gr. = 0.03
	Extract of hyoscyamus	to 3 gr. = 0.19 gm.

(4) If dyspnoea exist, dry secretions will almost invariably be found, and relief may be obtained by washing the larynx with Neb. Alkalina (p. 31), and afterwards using the remedies just recommended for preventing dryness.

(5) In cases accompanied by excessive secretions on vocalisation (laryngorrhœa) Mackenzie recommends the application of turpentine as a paint.

(6) If paresis of the tensors persist after the congestion has disappeared, or the voice remain feeble, electricity should be applied. The Faradic current is most suitable, though the continuous current has been used with benefit. In the first instance, it should be applied externally over the larynx, using quite a mild current for a few minutes only. The strength of the current may

be increased gradually, if necessary, and occasionally its direct application to the cords by means of an intra-laryngeal electrode may be advisable (Fig. 221, p. 555).

(7) If chronic tracheitis or bronchitis co-exist with the laryngeal catarrh, these conditions should be carefully treated both generally and locally, as the consequent cough and irritating discharge will keep up the chronic laryngitis.

2. Singer's Nodes or Chorditis Tuberosa.

This form of laryngitis is almost exclusively confined to voice-users, and is seen chiefly amongst singers and school-board

teachers, and only in females. It is undoubtedly due to faulty production and forcing of the voice, but it is aggravated by using the voice in over-heated and ill-ventilated rooms.

Hoarseness of the voice is the chief symptom, but if the node is small this may be hardly noticeable during ordinary conversation. When, however, the patient attempts to speak in public, teach, or sing, the voice becomes rough and

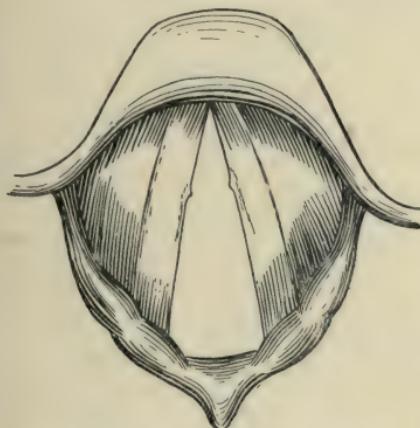


FIG. 205.—Very small singer's nodules.

uneven, and after a very short time so great a sense of local and general fatigue is experienced that the attempt has to be abandoned.

Pathological Changes.—The distinctive pathological change is the formation of nodules on the free margins of the cords, just at the junction of their middle and anterior thirds. One cord is first affected, but later on the opposite cord becomes involved. The nodules vary from the size of a pin's head to that of half a millet seed and are quite white in colour, though a slight pink blush may radiate from them on to the surface of the cords (Figs. 205

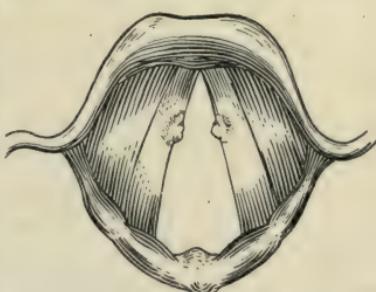


FIG. 206.—Large singer's nodules.

and 206). If neglected, they may become considerably larger and distinctly pink in colour. Pathologically they are due to heaping up of keratinised epithelium, accompanied by some hyperplasia of the connective tissue. They are closely allied to the pachydermatous swellings about to be described.

Special Treatment.—In the treatment of singer's nodes three objects must be kept in view, viz., to cure accompanying laryn-

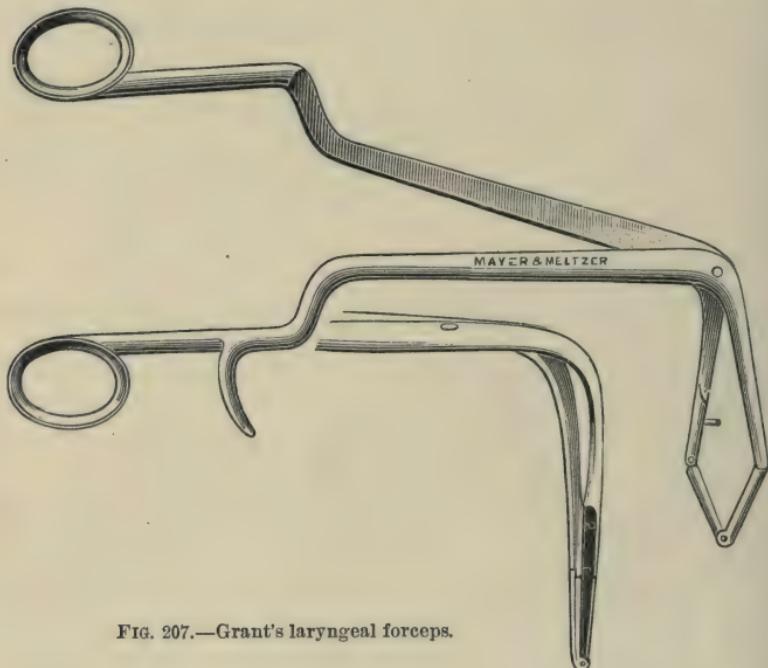


FIG. 207.—Grant's laryngeal forceps.

gitis, to get rid of the nodules, and to prevent their recurrence. The laryngitis must be treated on the lines already suggested (p. 515). The treatment of the nodules will depend on their size, the duration of their existence, and the occupation of the patient. In recent cases if the nodules are not very large, absolute rest of the voice and the application of astringents by means of inhalations or sprays may be sufficient to cause their disappearance; but if the nodules are large or have existed for some months, more energetic measures must be adopted. Undoubtedly the quickest method is to remove them with forceps, and this course may be safely adopted in teachers and speakers, but should be carried out only as a last resource in singers, in whom the slightest scarring at the edge of the cord may seriously impair

the finer qualities of the voice. If removal is decided upon it must be most carefully performed under cocaine anaesthesia (p. 65) in the way recommended for the removal of papillomata (p. 566); but it will be found that Grant's forceps (Fig. 207) are especially useful for the purpose and free from danger. In singers the application of strong astringents by means of a brush or cotton wool swab should first be tried. Perchloride of iron, 2 drs. to the oz. of water, or nitrate of silver from 40 to 60 grs. to the oz., are the most useful applications. In employing these, especially the latter, it is better to cocaine the larynx first, so that the application may be limited to the nodules, and the risk of a distressing and sometimes dangerous spasm may be avoided. The selected astringent should be applied at first twice a week, and later once a week, and the applications should be continued until the nodule has quite disappeared. Whatever method is adopted, it is most essential to insist on absolute rest of the voice during treatment, as vocal effort not only greatly retards progress, but often means permanent damage to the voice.

In considering the treatment likely to prevent a recurrence of the trouble it must be remembered that the existence of nodules is a sure proof of faulty production of the voice, and it is therefore evident that no permanent cure can be expected until this has been remedied. Lessons in voice production must consequently be enforced before the patient is allowed to return to work. It is necessary to exercise great care in the selection of a teacher, and a sharp distinction must be drawn between a teacher of elocution and a teacher of voice production. Many patients drift to the elocutionist, who is more likely to do harm than good, unless the voice is properly produced.

3. *Pachydermia Laryngis*

Indurated outgrowths of the epithelium of the larynx associated with marked dryness of the mucous membrane are the distinctive features of this form of laryngitis. The outgrowths may occur on the vocal processes or on the interarytenoid fold.

Pachydermia of the vocal processes can generally be traced to over-use and faulty production of the voice, but it is also met with in people whose employment necessitates the constant inhalation of dust or irritating fumes. It is commoner in

males than in females, and occurs generally between the ages of thirty-five and forty-five. Pachydermia of the inter-arytenoid fold is commoner in women than in men. It is especially associated with dry laryngitis and the formation of crusts, and is most usually seen in big fat women with strong alcoholic tendencies, who work in a dry vitiated atmosphere, as, for example, in a public-house bar. In both forms some nasal abnormality is often found, which is undoubtedly to a certain extent a causative factor. Rhinitis sicca and nasal obstruction are most often associated with pachydermia.

The chief symptom is more or less alteration of the voice, but when the vocal processes are affected, it is often surprising how comparatively little loss of the speaking voice there is. If the inter-arytenoid region is affected the loss of voice is sometimes considerable, owing to mechanical interference with the approximation of the cords. There may be discomfort and a sensation of a lump in the throat, and occasionally more or less dyspnoea, which, however, is not due to the outgrowths so much as to the formation of crusts.

Pathological Changes.—Pachydermatous outgrowths are the result of thickening of the epithelium, in the outer layers

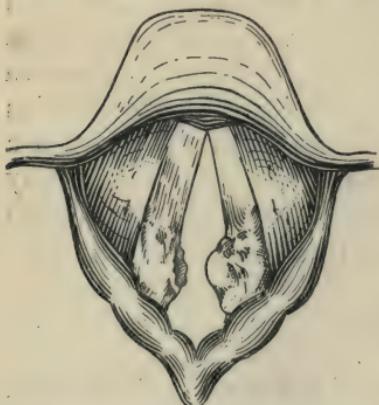


FIG. 208.—A marked example of pachydermia of the vocal processes.

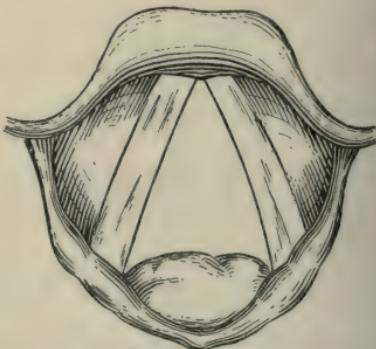


FIG. 209.—Pachydermatous swelling of the inter-arytenoid fold.

of which the cells become keratinised. The papillæ greatly increase in number, and more or less fibrous tissue may be formed in the submucous layer. On the vocal processes the outgrowths are oval in shape, greyish-pink in colour, and vary in size from that of a pea to that of a bean (Fig. 208). On one side the outgrowth comes to a peak, whilst that on the opposite

side is hollowed out to receive the point of its fellow, and hence the cords can often nearly meet on phonation. In the interarytenoid space the swelling varies very greatly in size, but often reaches very considerable dimensions; its surface is generally smooth except on phonation, when it appears to be divided by one or more deep fissures (Fig. 209); in colour it is greyish or tinged with pink. In long-standing cases it has almost a horny appearance, and feels hard and resistant to the probe.

Special Treatment.—The treatment of pachydermia is not very satisfactory, and except in very early cases complete recovery can seldom be expected.

In both forms of pachydermia it is most important to remove the patient from all sources of irritation, and to correct any deleterious habits. It is also important to treat at the outset any nasal abnormality, especially any condition which might lead to dryness of the laryngeal mucous membrane. Finally it is important to remember that pachydermia is but a part of a general laryngitis, and that it is necessary to treat the latter condition both generally and locally on the lines already suggested (pp. 513 and 515).

Apart from following these general indications, special measures must be taken with the hope of reducing the pachydermatous swelling. If recovery of the voice is a matter of great importance and the condition is not of long standing the patient should be absolutely prohibited from speaking, should constantly suck ice, and take 10 grs. of iodide of potassium, or $\frac{1}{16}$ gr. of proto-iodide of mercury three times a day; the bowels should be kept freely open by means of alkaline and sulphurous mineral water administered the first thing in the morning; the diet should be light, and consist of milk, eggs, and fish, alcohol and tobacco being entirely forbidden. *Locally* the larynx must be cleansed two or three times daily by means of an alkaline spray, especially when sticky secretions or crusts are present, and then astringents, such as those suggested under chronic laryngitis (p. 517) must be applied, preferably by means of a spray.

In old-standing and marked cases the same general treatment may be tried, and the question whether more active local measures are likely to be beneficial must be considered. Removal of the growth with cutting forceps, and destruction with chemical caustics, the electric cautery, or electrolysis have been

recommended and occasionally may be successful, but more often the relief is only temporary, and the growth recurs and even assumes larger dimensions than before. It is therefore usually better to rely on cleansing and astringent sprays to keep the patient comfortable, though sometimes one of the more radical methods may be tried; but it should not be repeated a second time if recurrence takes place. Of the suggested methods removal with forceps is probably the best. This is effected, after thoroughly cocaineising the larynx (p. 65), by punching out pieces of the growth by means of strong cutting forceps such as Krause's or Lake's. The growth will often be found to be extremely hard and almost impossible to cut, in which case it is better to relinquish the attempt than to use undue force. Occasionally, however, the nipping of the growth in the blades of the forceps will cause sloughing, and so produce some reduction in its size.

When removal is inadvisable or impossible, the local application of pure chromic acid fused on a probe (p. 36) or of an alcoholic solution of salicylic acid (5 per cent. or even stronger) may be tried. Steaming inhalations of a 3 per cent. solution of acetic acid used for ten minutes three times daily, and the application of dilute solutions of lactic acid or iodine have also been recommended. The destruction of the growth with the galvano-cautery should be undertaken with the greatest caution, as there is a very definite risk of subsequent acute oedema, and moreover if it is used too freely it may lead to more mischief to the voice than the presence of the growth occasions. Destruction of the growth by electrolysis is carried out by means of special laryngeal electrodes. The larynx is first thoroughly cocaineised, and then the electrodes are carefully introduced and the needles plunged into the growth. A current of from ten to twelve milli-ampères is allowed to pass for three or four minutes. In the course of a week a slough will separate and a deep hole will be left in the mass. When healing is complete the process may be repeated, if necessary. This form of treatment is disagreeable and painful to the patient, tedious to the operator, and therefore cannot be recommended as a routine method.

4. Hæmorrhagic Swellings

Small submucous blood tumours on the upper surface or free edges of the cords may occur in the course of laryngitis as

a result of coughing or some sudden and violent vocal effort. As a rule they do not cause any special symptoms, but if situated on the edges of the cord there will be increased impairment of the voice.

Pathological Changes.—In addition to the changes due to the laryngitis, small red cystic-looking tumours may be seen on the upper surfaces or edges of the vocal cords, generally of the size of a peppercorn, though occasionally much bigger. Later, they become purple in colour and of more solid appearance. If both cords are affected the tumours are usually situated symmetrically at about the junction of their anterior and middle thirds. They often remain stationary for very long periods, but finally become absorbed.

Treatment.—In these cases it is the chronic laryngitis which requires treatment. The blood tumours themselves may, as a rule, be left alone, and will finally disappear. If, however, they persist after the laryngitis has subsided, and are causing any trouble, they should be removed by means of laryngeal forceps (p. 566).

5. Chronic Subglottic Laryngitis

Definition.—A chronic and gradually increasing swelling in the subglottic region leading to serious dyspnoea.

Etiology.—The above definition is purposely left indefinite because the swelling is not always of a simple inflammatory nature. It seems beyond question that cases do occur as a result of a simple chronic inflammatory process, but since operative interference has been more frequent, it has been clearly shown that a large number of such cases are due to either malignant disease, tubercle (p. 101), or syphilis. Occasionally, also, it may be due to chronic infective rhino-scleroma, or it may occur in the course of, or as a sequel to, some of the acute infectious diseases such as typhoid and typhus. As regards the simple inflammatory form, the cause is unknown. All the predisposing and exciting causes of ordinary chronic laryngitis may be etiological factors in the production of this particular variety: exposure to wet and cold, straining the voice, the abuse of alcohol, and cigarette smoking have been specially suggested. Bosworth considers that the "lymphatic habit" is an important cause of the affection, and has observed two cases in which removal of the faucial or lingual tonsils ameliorated the con-

dition of the larynx. Vierordt has reported a case which seemed to be intimately associated with goitre.

Pathological Changes.—The chief morbid change is the formation of gradually increasing swellings immediately below the cords, involving their under surfaces. They are usually bilateral, and grey or pink in colour, and are best seen during abduction of the cords. Occasionally they become oedematous, in which case they look grey and semi-translucent. Both the mucous and submucous tissue are involved, and sometimes the underlying muscles also. The morbid process is generally limited to the subglottic region, but there may be more or less general chronic laryngitis.

Symptoms.—A muffled laboured voice, gradually becoming aphonic, a sensation of weight and pricking in the throat, and a constant hawking, with the expulsion of small pellets of mucus, are the chief symptoms at the commencement of the case. Later, the most serious symptom is dyspncea, the onset of which is gradual. At first it is only noticeable during expiration, but afterwards inspiration also becomes difficult, until finally dangerous dyspncea is established, which will cause death unless relieved by tracheotomy. There are often intermittent attacks of acute dyspncea, probably due to the onset of acute or subacute catarrh, to which the patient is extremely liable. These attacks may be so severe as to necessitate a hurried tracheotomy.

Diagnosis.—The gradually increasing dyspncea combined with the clinical appearances will lead to a correct diagnosis of the cause of the symptoms, but the exact nature of the swelling is often only determined after operation or death.

Prognosis.—The prognosis is always very grave whatever the cause of the disease. Tracheotomy will generally be necessary to prevent death by suffocation.

Treatment.—In early cases of a simple inflammatory nature, the local treatment recommended for ordinary chronic laryngitis must be carefully carried out, and will occasionally arrest the progress of the disease. Internally iodide of potassium (5 grs. to 10) or proto-iodide of mercury ($\frac{1}{16}$ gr.) should be given three times a day. In young and weakly subjects iodide of iron may give better results.

In later cases, when the subglottic swelling is already marked, the internal administration of iodides may also be tried, and lactic acid, 50 per cent., salicylic acid, 5 per cent., or nitrate of

silver, 40 grs. to the ounce of water, may be applied locally, or scarification attempted; but there is no great hope of obtaining resolution of the swelling either by local or general means. Iodide of potassium should only be given when the patient can be kept under constant supervision, for fear it should cause œdema with rapid development of dangerous dyspnoea. If all remedies fail, the case resolves itself into one of chronic organic stricture of the larynx, and must be treated accordingly. If dyspnoea is threatening life, a tracheotomy must be performed without delay; but even if there is no such urgency, preliminary tracheotomy is often advisable, as it puts the patient at once out of danger of suffocation and allows time for consideration as to what, if any, further step should be taken to relieve the stricture. If no further steps are advisable, it is certain that the tracheotomy tube will have to be worn permanently, which carries with it its own worries and dangers. On the other hand, such other measures as are at the surgeon's disposal have not so far been attended with any very marked success. Thyrotomy, with the removal of the overgrowths, or gradual dilatation of the stricture with Schroetter's bougies or O'Dwyer's intubation tubes, are the measures which have been tried. Gradual dilatation is tedious, and seldom shows permanently good results. Thyrotomy, followed by excision of the overgrowth or its destruction with a Paquelin's cautery, certainly holds out better chances of permanent relief, and, if the patient's general condition is good and there are no definite contra-indications, this operation may be undertaken. The result may be satisfactory, and even if it does not prove so, the patient is no worse off, for in any case a permanent tube will be necessary. As already stated, on opening the larynx the growth may show signs of malignancy, tubercle, or syphilis. If it prove to be malignant, the cartilages and the surrounding soft parts are generally found infiltrated and the disease has then passed beyond the limits of a successful removal. In this case the wound should be sutured and a tracheotomy tube left in. If the growth is tubercular or syphilitic, an attempt may be made to dissect away the diseased area.

If from the first there are suspicions that the condition is due to syphilis, iodide of potassium should be given in much larger doses (from 20 to 30 grs. three times a day), and it should be combined with hot baths and mercurial inunctions, careful dieting, and rest in bed (p. 156). Should there be evidences of tubercle,

the case must be treated as such, and operation undertaken only if there are clear evidences that it is a purely local lesion (p. 116).

II. LARYNGITIS SICCA

Definition.—Laryngitis sicca is not a disease *per se*, but merely a symptom occurring in the course of various local or more general morbid conditions, and it is therefore impossible to give an accurate definition. The term is used loosely for any condition in which there is either deficiency of the secretions, or where the secretions are viscid and tend to dry into crusts.

Etiology.—Dryness of the laryngeal mucous membrane occurs chiefly in one of three conditions, namely, in general anaemia, in some forms of chronic hypertrophic laryngitis, and in atrophic rhinitis. The anaemic, the inflammatory, and the foetid varieties will, therefore, be described. All three forms are almost invariably secondary to similar conditions in the nose, or in some inflammatory cases to nasal stenosis. The *anaemic form* occurs almost exclusively in women, especially in young girls suffering from general anaemia. The *inflammatory variety* may be associated with almost any form of chronic laryngitis. It is commoner in men than in women, though it is by no means uncommon in barmaids, who live surrounded by tobacco smoke and often take a free amount of alcohol. Gout, plethoric habit of body, chronic alcoholism, dyspepsia, abuse of tobacco, and work in a dry, vitiated or dusty atmosphere, may all be looked upon as causes of this complication of chronic laryngitis. Nasal stenosis, which necessitates mouth breathing, is also a common cause. The *foetid form* is always secondary to atrophic rhinitis with ozæna.

Pathological Changes.—In the *anaemic form* the mucous membrane appears pale, thin, and dry. There are rarely any crusts, but thin streaks of mucus may sometimes be seen, stretching between the cords. The *inflammatory form* is marked by redness, dryness, and general swelling of the mucous membrane, which often looks glazed and shiny. Black mucous crusts of varying size are seen scattered about the larynx, and occasionally encroach upon the glottis or prevent the approximation of the cords. In the *foetid form* the mucous membrane is very red and glazed, but swelling is not often a marked feature. Scattered over the mucous membrane green stinking crusts of dried muco-pus may be seen both above and below the cords.

Symptoms.—In the *anaemic form* the symptoms are not very marked. There is some discomfort about the larynx, some cough and slight hoarseness, which latter becomes troublesome on any attempt at singing or public speaking. In the *inflammatory form* there may be aching and even some pain in the throat; cough is often very troublesome, and is not relieved until the small black crusts, to which it is due, have been expectorated. The voice is always affected, but varies according to the position of the crusts and the amount of hyperplasia. When there is considerable hyperplasia and many crusts there may be more or less dyspnoea, which occasionally is very severe. In the *fætid form* a horribly foul breath is the symptom most usually complained of. The voice is at the same time hoarse, and the expectoration of the crusts is effected only after severe bouts of coughing. There is usually an absence of pain. A varying amount of dyspnoea is not unusual, especially when the crusts adhere below the cords.

Diagnosis is always easy, and the *prognosis* is ultimately good, but all three forms run a very chronic course and show no tendency to spontaneous recovery.

Treatment.—In the *anaemic form* general treatment for the anaemia is of the first importance, but the dryness of the larynx may be relieved by the use of the alkaline spray (p. 31), to each ounce of which 10 gr. of chloride of sodium should be added, followed by an inhalation of creosote (p. 53). The nose, if affected, must be treated on the lines already suggested (p. 301).

In the *inflammatory form*, the general chronic laryngitis must of course be attended to, but the dryness renders certain methods of treatment specially important. All bad habits, such as excess in alcohol and tobacco, must be corrected, and the patient removed from any insanitary surroundings or from occupations entailing work in a dust-laden atmosphere; the bowels should be kept freely open by means of a morning dose of Mistura Alba (p. 59) or one of the aperient waters, such as Carlsbad or Apenta, whilst careful dieting must be adopted. The mixture of chloride of ammonium (p. 488) is often useful. In slight cases the local treatment consists in washing the larynx night and morning with the Nebula Alkalina (p. 31), followed by the inhalation of either the Vapor Creosoti or the Vapor Cubebæ (p. 53). The Nebula Alkalina may be used by means of an ordinary spray producer or Siegle's steam spray. These methods, combined with general treatment and attention to the

nose and naso-pharynx, will generally prove sufficient in slight cases. In more aggravated cases it is advisable for the surgeon himself to wash out the larynx daily for the first week or so, and after washing to spray the parts with Nebula Menthol (10 gr. to 1 oz. of paroleine), or, when the sensation of dryness is very marked, with 2 gr. of carbolic acid to the ounce of paroleine. If the patient cannot attend regularly he must make an effort to carry out the treatment for himself (p. 51). Later when the dryness is less, recovery may be hastened by painting the larynx with nitrate of silver (20 gr. to the ounce), chloride of zinc (15 gr. to the ounce), or with Mandl's fluid (p. 38). Occasionally the use of the spray will induce violent retching, in which case it is better to rely on inhalations, and occasionally to swab out the larynx by means of cotton wool saturated with the alkaline spray solution and attached to a carrier. The dyspnoea and much of the aphonia can always be relieved by cleansing the larynx.

In the *fætid form*, if the nose can be kept moist and free from crusts by the means suggested on p. 311, the tendency to crust formation in the larynx will soon cease. In the meanwhile the larynx should be kept clean by a spray, and the mucous membrane gently stimulated by the use of Vapor Creosoti or Pigmentum Mandl.

III. CHRONIC PERICHONDRTIS

Definition.—Chronic perichondritis of the laryngeal cartilages secondary to some other disease or injury of the larynx.

Etiology.—By far the most common causes of this form of perichondritis are syphilis, tubercle, and cancer, though it may be due to inflammatory action set up by injuries, or to the lodgment of a foreign body. The perichondrium is, as a rule, affected by direct spreading of the primary disease from the more superficial to the deeper parts, though in syphilis it may be the original seat of a gummatous deposit, and in tubercle, also, localised deposits may occasionally occur.

Pathological Changes.—As a rule, the pathological changes observed are those of the disease on which the perichondritis depends. The perichondritis is often not discovered until suppuration occurs and a necrosed portion of cartilage is found. On the other hand, the swelling and oedema associated with the

onset of the perichondritis may so alter the appearance of the larynx that the primary disease may be hidden or overlooked, and the case mistaken for one of acute septic perichondritis (p. 499). When due to the presence of a foreign body there is localised swelling and oedema, and occasionally some signs of pus. The swelling is often extensive enough to hide the foreign body entirely.

In addition to the above class of cases, one or two special forms must be mentioned, namely:—

(1) **Adhesive Perichondritis.**—In this variety the inflammatory process, instead of leading to suppuration, results in the formation of dense connective tissue, producing much thickening of the parts (Semon).

(2) **Diffuse Gummatous Infiltration of the Perichondrium.**—This is characterised by great thickening of the perichondrium with inflammation of the overlying structures. The inner surfaces of the alæ of the thyroid are most commonly affected, in which case there is swelling both above and below the cords, whilst the cords themselves are pushed inwards towards the middle line and their movements are much limited or even entirely abolished. The lumen of the glottis is considerably reduced in size. This condition remains stationary for very long periods if untreated, but finally results in either adhesive thickening or suppuration, more commonly the former (p. 153).

(3) **Local Tuberculous Deposit.**—Occasionally a purely local deposit of tubercle, quite unconnected with phthisis, may occur either in the perichondrium or in the crico-arytenoid joint. As a rule it breaks down sooner or later, and causes a large chronic abscess, but in the crico-arytenoid joint it may become organised and lead to complete fixation of the joint (p. 533), or if the perichondrium is much involved it is sometimes followed by necrosis of the arytenoid cartilage (Fig. 210).

Symptoms.—Pain and tenderness over the larynx, slight and slowly increasing dyspnoea, and some dysphagia are the chief symptoms. Occasionally there may be a slight rise of the temperature. If pus forms, the resulting abscess is indolent, though when it is opened large portions of bare or necrosed cartilage are often found. A large

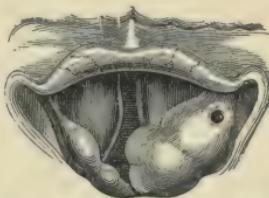


FIG. 210.—Laryngeal appearances after separation and expectoration of the arytenoid cartilage in a case observed by Mackenzie; probably of tuberculous origin.

quantity of pus may form before the abscess breaks, and, consequently, if it point and rupture intra-laryngeally, sudden asphyxiation may occur.

Prognosis.—The prognosis entirely depends on the cause. If due to malignant disease or if secondary to phthisis the prognosis is very grave, but when due to syphilis, trauma, or a foreign body the prognosis is more hopeful, though if there is extensive disease with retained sequestra, the patient may succumb to chronic suppuration, exhaustion, or septic pneumonia. Death may also occur from suffocation due to the sudden bursting of a large abscess. In all cases the prognosis as to voice is bad, and more or less permanent dyspncea may result.

Diagnosis.—When secondary to syphilis, tubercle, or cancer, it is often difficult in the early stages to determine whether the perichondrium and underlying cartilage has become involved. On the other hand, as pointed out above, the swelling and oedema due to perichondritis may sometimes entirely mask the original cause. When due to a foreign body, which the swelling and oedema may entirely hide, the diagnosis is extremely difficult. In all doubtful cases a radiograph should be taken, which often throws a wholly unexpected light on the condition.

Treatment.—This will vary with the cause and with the stage of the disease. If suppuration has not occurred, the underlying cause should as far as possible be vigorously treated. In syphilitic cases iodide of potassium must be given in large doses combined with mercurial inunctions (p. 156). In tuberculosis of the larynx, the general and symptomatic treatment, already recommended, must be carried out (pp. 106 and 124), but in malignant cases little can be done except the relief of symptoms (p. 585) unless the disease be very limited and suitable for operation. If due to the presence of a foreign body, it must be removed without delay (p. 592). When owing to its impaction, or to the obstruction caused by surrounding swelling, it is impossible to accomplish this by intra-laryngeal methods, thyrotomy (p. 82) will be necessary. If suppuration has occurred, the pus should be evacuated without delay by a free incision with an intra-laryngeal lancet (Fig. 97, p. 163). Directly the incision is made, the patient's head should be bent well forward to prevent as far as possible the pus reaching the lungs. If an abscess has formed and burst, leaving a discharging sinus, the case must be treated on the lines already suggested for the

later stages of acute septic perichondritis (p. 501). At any time in the course of perichondritis severe dyspnoea may arise, for the relief of which tracheotomy must be performed (p. 77).

IV. CHRONIC ANKYLOSIS OF THE CRICO-ARYTENOID JOINT

Definition.—Fixation of the crico-arytenoid joint from disease of the joint itself (true ankylosis), or from disease in its immediate neighbourhood interfering with the mechanism of the joint (false ankylosis).

Luxation of the arytenoid from its articulation with the cricoid may occur alone, or co-exist with ankylosis.

Etiology.—The immediate causes both of true and false ankylosis of this joint are (1) suppuration in or about the joint, generally the result of acute or chronic perichondritis; (2) adhesive inflammation characterised by the formation of dense connective tissue without exudation occurring in the joint, or in the perichondrium of the adjoining cartilages; (3) organisation of inflammatory exudates; (4) cicatricial bands resulting from ulceration. It is thus evident that the movements of this joint may be partially or completely abolished by most of the diseases and injuries which may befall the larynx. It may result from simple acute laryngitis, or from laryngitis complicating any of the acute specific fevers; also from laryngitis of a gouty or rheumatic origin, from any form of perichondritis, and from acute septic laryngitis. It is of common occurrence in syphilis, tubercle, and cancer, and occurs after blows and fractures, and after strangling or cut throat. Finally, it may result from disuse in cases of long-standing paralysis.

Pathological Changes.—In true ankylosis the fixation is generally complete; in false ankylosis there may be a slight degree of movement. The arytenoid, and the cord attached to it, may be fixed in any position, but the cadaveric position (p. 537) or midway between that and the middle line is perhaps the most usual. If both cords are fixed they are not necessarily or even usually in the same position, but one may be in the middle line and one in the cadaveric position, and so on. In recent cases some swelling is seen about the arytenoid, but in cases of old standing it may be very difficult to detect signs of past disease. If luxation of the arytenoid is present,

the affected cartilage becomes out of line with its fellow and looks distorted. Luxation apart from ankylosis causes considerable limitation of movement.

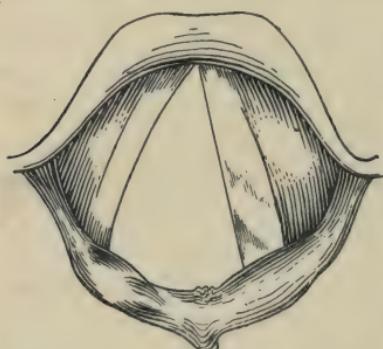
Symptoms.—The two chief symptoms which may call attention to the existence of ankylosis are varying degrees of aphonia and dyspnoea. There is generally considerable alteration of the voice, except when both cords are fixed in the middle line, or when one cord only is fixed and the active cord is able to meet it during phonation. Luxation sometimes causes a falsetto voice from increased tension of the cords. Complete aphonia occurs whenever the fixation of the cords is such as to render it mechanically impossible for them to meet. Dyspnoea is often present, but also varies with the position of the cords. When both cords are fixed in the middle line there will be serious dyspnoea, generally necessitating surgical interference.

Diagnosis.—When active signs of the disease on which the ankylosis depends are present, the diagnosis of both true and

false ankylosis is generally easy; but when all signs of active disease have disappeared, and when little, if any, tumefaction round the joint is left, there is often great difficulty in distinguishing between paralysis of the cords and ankylosis of the joint; indeed it is often an almost impossible task to decide. Any appreciable tumefaction or the slightest scarring anywhere in the larynx, especially in the neighbourhood of the arytenoids, together with fixation of the cords, is strongly suggestive of ankylosis

FIG. 211.—Fixation of left cord, probably due to an old syphilitic lesion. The thickening over the arytenoid cartilage and slight scarring in the inter-arytenoid region determines the diagnosis in favour of fixation.

(Fig. 211). Partial active movement of the arytenoid during adduction is in favour of limited fixation rather than paralysis, and absolute fixation is in favour of complete ankylosis. In true paralysis, at any rate at first, the arytenoid on the affected side will be displaced by that on the active side during the effort which is made on phonation to bring the sound cord across the middle line to meet the fixed cord. In old-standing cases of paralysis, however, the joint becomes fixed from disuse, and then no displacement will take place. Fixation of both cords in the middle



line has to be distinguished from double abductor paralysis; and a point of great diagnostic value is that in fixation the cords are tense and quite immobile, whereas in paralysis they are flaccid, and tend to be sucked in towards the middle line during inspiration and puffed upwards and outwards during expiration, or as is sometimes said they flap about in the air current.

Prognosis.—The fixation of both cords in the middle line generally necessitates tracheotomy and the permanent wearing of a tube, which has its own risks. The prognosis as regards the voice is bad.

Treatment.—If any of the acute or chronic pathological processes enumerated in describing the etiology are in progress, and if permanent fixation of the joint is to be avoided, these conditions should be promptly treated according to the methods already described in discussing them. In cases which come under notice when all active disease has subsided, iodide of potassium given in increasing doses up to 40 grs. three times a day is sometimes useful. At the same time the red iodide of mercury ointment should be rubbed into the skin over the larynx. Locally no treatment should be attempted except when there is dyspnoea. If this is severe, and especially if there are recurring paroxysms, tracheotomy will be necessary. If the fixation is due to true ankylosis no more can be done, and the tracheotomy tube must be worn permanently. If due to old syphilis, and the fixation is accompanied by adhesions and cicatricial bands, there is a remote chance of being able to dilate the glottis as described under the treatment of syphilitic laryngeal stenosis (p. 164). For luxation without ankylosis, Cheval recommends a strong Faradic current applied directly to the posterior wall of the larynx by means of a double electrode so as to tetanise the muscles. He reports a case in which by this means he was able to get the cartilage pulled back by muscular action into its proper place.

CHAPTER XXIV

NEUROSES OF THE LARYNX

I. MOTOR NEUROSES: A. SPASMODIC AFFECTIONS.—(a) *Respiratory Glottic Spasm*.—(i.) Laryngismus Stridulus.—(ii.) Spasm in Adults.—(iii.) Clonic Spasm.—(b) *Neuroses of Co-ordination*.—(i.) Choreic Movements.—(ii.) Laryngeal Cough.—(iii.) Phonic Spasm.—(iv.) Vertigo.—B. LARYNGEAL PARALYSES.—(a) *Of Muscles supplied by the Recurrent Laryngeal Nerve*.—(i.) Abductor Paralysis, Bilateral and Unilateral.—(ii.) Complete Paralysis.—(iii.) Adductor Paralysis.—(iv.) Paralysis of Internal Tensors.—(b) *Of Muscles supplied by the Superior Laryngeal Nerve*.—Paralysis of External Tensors and Depressors of the Epiglottis.

II. NEUROSES OF SENSATION.

NEUROSES naturally divide themselves into two main divisions, namely, (1) Motor and (2) Sensory Neuroses. Motor neuroses must be further subdivided into Spasmodic Affections and Paralyses.

I. MOTOR NEUROSES

Before entering upon the various motor neuroses of the larynx it is well to enumerate the various muscles which may be affected, and to summarise the present knowledge of their nerve supply.

Muscles.—There are four groups of muscles : (1) The adductors ; (2) the tensors ; (3) the closers or sphincters of the larynx ; and (4) the abductors. The adductors and tensors are concerned in phonation, the closers in deglutition, and the abductors in respiration.

The *adductor muscles* are :—

The crico-arytenoidei laterales.

The external part of the thyro-arytenoideus.

The arytenoideus.

The *tensor muscles* are :—

The thyro-arytenoidei interni (internal tensors).

The crico-thyroidei (external tensors).

The *closers* or sphincters of the larynx are :—

The thyro-epiglottidei and aryteno-epiglottidei.

Probably all the adductor muscles.

The *abductor muscles* are :—

The crico-arytenoidei postici.

Positions of the Cords.—By the action or in some instances by the want of action of the laryngeal muscles the vocal cords can assume four main positions (Figs. 212 to 215). Starting

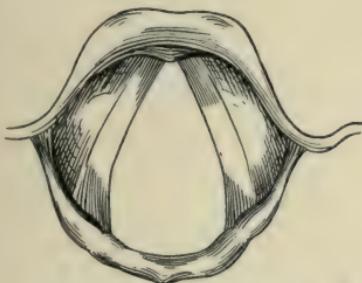


FIG. 212.—Position of the cords during deep inspiration.

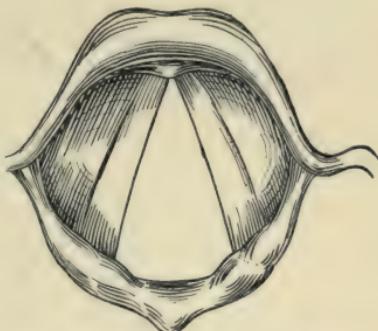


FIG. 213.—Position of the cords during quiet inspiration.

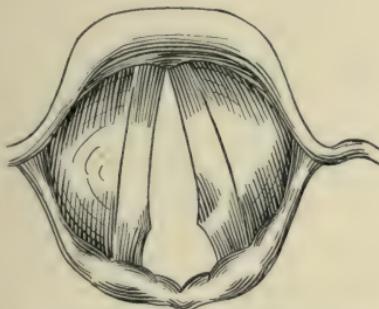


FIG. 214.—The cadaveric position of the cords.

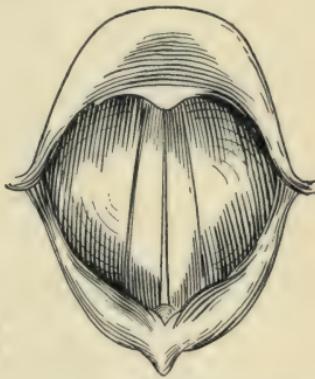


FIG. 215.—Position of the cords during phonation.

from without, there is first the position of extreme abduction, as seen in deep inspiration; then that of moderate abduction, as seen in quiet respiration; thirdly, the cadaveric position, as seen after death or in complete recurrent paralysis; and lastly, the median position, as seen in phonation. It is important to bear in mind these four positions when determining the nature and degree of a case of paralysis.

Nerve Supply.—As regards the nerve supply of the muscles, all the adductors, tensors, and abductors are supplied by the recurrent laryngeal nerves, with the single exception of the crico-

thyroideus, which is supplied by the superior laryngeal. This latter nerve also supplies the thyro-epiglottic and ary-epiglottic muscles, and occasionally sends a small branch to the arytenoideus. It is also the sensory nerve of the whole of the larynx. Both adduction and abduction have separate cerebral cortical centres, situated in close proximity to each other. The adductor centre is situated in the foot of the ascending frontal gyrus, just behind the lower end of the praecentral sulcus. The centre in each hemisphere has a bilateral action, so that if one centre is completely destroyed, the other centre will control the adduction of both cords, and therefore unilateral abductor paralysis of cortical origin does not occur. The abductor cortical centre is situated just in front of and below the anterior extremity of the coronal sulcus, and the centre on either side has, like the adductor centre, a bilateral action, so that unilateral abductor paralysis from destruction of one centre is not possible. Abduction, being an involuntary action associated with respiration, has an important bulbar representation situated in the ala cinerea, in the lower half of the calamus scriptorius. Although the recurrent laryngeal nerves supply both the abductors and adductors of the larynx, yet clinically it is found that pressure on this nerve, or progressive organic disease of the centres or trunks of the motor laryngeal nerves, invariably produces in the first instance abductor paralysis. This proclivity of the abductors to succumb before the adductors is known as Semon's Law. Next to the abductors, the internal tensors and the arytenoideus succumb, and lastly the adductors.

Spasmodic Affections

These may be due to affections of the centre, nerve trunks, or single nerve twigs. They must be considered under the following heads :—

A. Respiratory Glottic Spasm.

1. Laryngismus stridulus.
2. Spasm of the glottis in adults.
3. Rhythmical clonic spasms of the adductors.

B. Neuroses of Co-ordination.

1. Choreic movements.
2. Nervous laryngeal cough.
3. Phonic spasm.
4. Laryngeal vertigo.

A. RESPIRATORY GLOTTIC SPASM

1. Laryngismus Stridulus.—**Definition.**—Attacks of dyspnœa in children due to spasmodic contraction of the adductors.

Etiology.—The chief predisposing cause of laryngismus stridulus is rickets, with which it is almost invariably associated. It occurs in ill-nourished unhealthy children from six months to two years of age, though attacks may occur up to the eighth or ninth year.

The exciting causes of the attack are usually indigestion, intestinal parasites, adenoids, teething, or emotional excitement. Whooping-cough frequently, and measles sometimes, may be responsible for its occurrence.

Symptoms.—The onset commences quite suddenly with a few noisy short inspirations, which become longer and slower until finally respiration ceases. The child's eyes become fixed and staring, and the countenance is one of extreme anxiety. The face, at first flushed, soon becomes livid and covered with cold perspiration. The attack lasts from fifteen seconds to two minutes, and, though as a rule spontaneous recovery takes place, death may occur from asphyxia, and loss of consciousness is not unusual. The attack is sometimes accompanied by spasm of the facial muscles, and by spastic contractions of the hands and feet (carpopedal contraction).

Diagnosis.—This affection must be distinguished from dyspnœa accompanying acute laryngitis in infants (p. 489). The chief point of difference is the entire absence of any laryngeal symptom between the attacks of laryngismus stridulus, whilst in acute laryngitis there is always some hoarseness or loss of voice, and cough.

Prognosis.—As a rule the attacks pass off leaving the child quite well, and as his age increases the tendency to attacks diminishes and finally disappears. Occasionally death may occur from asphyxiation, and therefore the prognosis must always be guarded. It is said that cases in which there is no preliminary inspiratory stridor are the most fatal.

Treatment.—(i.) *Of the Attack.*—The onset is so sudden and its duration so short that often treatment is out of the question; but on the first warning of an attack, the child should be placed in the sitting posture and slapped on the back, and ammonia or strong acetic acid held to the nose. The clothes should be loosened, and cold water should be applied to the face and head, whilst if time permit the legs and body may be immersed in hot water

(95° F.). If asphyxia is imminent, tracheotomy or intubation should be at once performed, if surgical aid is at hand.

Other methods have been recommended, such as the injection per rectum of a few drops of chloroform suspended in milk, the hypodermic injection of morphine or apomorphine, the administration of the yellow sulphate of mercury in emetic doses, tickling the fauces with a feather, hooking the epiglottis forward, compression of the carotids, and pressure on the pneumo-gastric nerves. They have all apparently proved useful in certain cases. If breathing has ceased, the application of a fairly strong Faradic or constant current to the back may sometimes restore respiration, and it is often worth while to instruct the parents to keep a battery in constant readiness. Mackenzie states that an enema of twenty to thirty drops of tincture of asafoetida to an ounce of warm gruel is a safe and useful remedy. He also recommends musk during the attack if the child is able to swallow, or if not, immediately after it, for which he employed the following formula :—

R.	Musk	1½ gr. = 0·10 gm.
	White sugar	2 gr. = 0·14 gm.
	Powdered acacia	2 gr. = 0·14 gm.
	Syrup of orange flowers	20 m. = 1·26 c.c.
	Water	to 1 dr. = 3·75 c.c.

(ii.) *Between the Attacks.*—If the attacks are occurring with any frequency or are of an alarming nature, a purgative dose of grey powder combined with bicarbonate of sodium and carbonate of magnesia, two grains of each, should be administered at once, and 5 to 20 minims of syrup of chloral hydrate in water, or a mixture of bromide of potassium with belladonna, such as the following, should be given four times a day :—

R.	Bromide of potassium	1 gr. to 5 gr. = 0·07 gm. to 0·32 gm.
	Tincture of belladonna	1 m. to 3 m. = 0·06 c.c. to 0·19 c.c.
	Glycerin	5 m. = 0·31 c.c.
	Water	to $\frac{1}{2}$ oz. = 15 c.c.

Having reduced the frequency of the attacks, it is necessary to treat the predisposing and exciting causes. As already mentioned, rickets is the underlying cause of the vast majority of cases, and it must be treated on the ordinary lines; fresh air, careful ventilation of rooms, warm clothing, nutritious diet, the

administration of cod-liver oil and calcium hypophosphite, being especially indicated. The following is a useful formula :—

R.	Hypophosphite of sodium	1 gr. = 0·07 gm.
	Hypophosphite of calcium	1 gr. = 0·07 gm.
	Cod-liver oil	30 m. = 1·87 c.c.
	Powdered acacia	6 gr. = 0·41 gm.
	Oil of cassia	$\frac{1}{8}$ m. = 0·008 c.c.
	Powdered tragacanth	$\frac{1}{2}$ gr. = 0·04 gm.
	White sugar	5 gr. = 0·34 gm.
	Water	to 1 dr. = 3·75 c.c.

If indigestion is the exciting cause, most rigid attention must be given to the child's diet, and great care must be exercised not to overload the stomach at any one meal. If constipation is present, it must be corrected; if worms are suspected or proved to exist, they must be attacked by the usual methods; if post-nasal catarrh, adenoids, or enlarged tonsils are found, they must be treated on the lines laid down in other chapters of this book. If the attacks accompany difficulties of teething, and recur frequently, lancing the gums may cut them short. If emotion seems to promote an attack, the parents must do what they can to keep the child quiet and free from all excitements. Lastly, if enlarged bronchial glands are the exciting cause, the treatment must be general and include iodide of iron. In infants an attack is occasionally induced by taking the breast, in which case careful spoon-feeding must be tried.

2. Spasm of the Glottis in Adults.—**Etiology.**—This form of spasm is most commonly caused by peripheral irritation, but may be due to direct irritation of the nerve trunks or to central lesions, whilst occasionally it is functional or hysterical in origin.

Amongst the sources of peripheral irritation which may lead to a spasm may be mentioned—the entrance of food, drink, or other foreign bodies into the larynx, the presence within the larynx of movable neoplasms, chronic laryngitis, tuberculous lesions, crusts, and possibly irritation from an elongated uvula. The nerve trunks may be irritated by aneurysms, malignant mediastinal glands, and bronchocele. Amongst the central lesions spasm is met with in tabes dorsalis (laryngeal crises), hydrophobia, and tetany. Functional spasm may be produced by very slight causes, such as emotions or an examination with a laryngoscope.

Symptoms.—These are the same as in laryngismus, but as a rule very much milder. The dyspncea varies from a few noisy

inspirations to cessation of breathing with loss of consciousness. It is rarely fatal, but may very occasionally be sufficiently severe to necessitate tracheotomy. Functional cases may be paroxysmal or continuous. If continuous the cords tend to come together during inspiration, and fall apart a little on expiration (perverted action).

Diagnosis.—The nature of the attack itself is generally obvious, but it is often difficult to determine its underlying cause. Continuous functional spasm may simulate double abductor paralysis (p. 548).

Treatment.—(i.) *Between the Attacks.*—This must necessarily depend upon their inducing cause. If a foreign body is present, it must be located and removed, and if a neoplasm, it must be dealt with as directed in Chapter xxv. If there is an elongated uvula, and no other cause for the spasm can be discovered, it should be amputated (p. 447). If crusts are present, the nasal condition on which they almost invariably depend must be treated, and the larynx must in the meanwhile be kept clean and free from crusts by the use of a spray of alkaline lotion, followed by a menthol spray (15 grs. to an ounce of paroleine). Apart from the formation of crusts it is highly necessary to examine the nose and naso-pharynx, and to correct any unhealthy conditions which may exist in either. If the spasm is due to irritation of the nerves by aneurysms, new growths, or enlarged glands, or if due to central lesions, these conditions must be treated as far as is possible.

In functional cases general treatment is very important, and should mainly consist in administering suitable tonics, and in regulating the diet and general hygiene of the patient. The daily use of a cold bath, if not otherwise contra-indicated, and properly regulated outdoor exercise, are valuable. If the laryngeal spasm is more or less continuous or often repeated, bromide of potassium or sodium is indicated in doses of 10 grs. three times daily, which should be gradually increased to 60 grs. three times a day if necessary. Valerianate of zinc combined with asafetida in the form of a pill is also useful (p. 360).

In all forms of adult laryngeal spasm it is well to prohibit all irritating articles of diet, alcohol and tobacco, and to caution the patient to take some care in swallowing. Certain local applications are sometimes useful in warding off attacks, such as a 2 per cent. solution of cocaine used twice daily by means of a spray,

or the inhalation night and morning of the Vapour of Compound Tincture of Benzoin. In many cases, especially those of functional origin, the local application of the Faradic current to the back of the neck proves beneficial in its results.

(ii.) *Of the Attack.*—As already mentioned the attack is usually slight, and therefore requires but little immediate attention. If severe, any of the means suggested for laryngismus stridulus may be tried. In ordinary cases the inhalation of strong smelling salts, and in laryngeal crises of nitrite of amyl, will often give relief. In bad cases chloroform inhalations should be tried. Forty drops of chloroform are added to half a pint of water at 150° F. (or 65° C.), and the steam inhaled. A further forty drops of chloroform are added every five minutes, and the inhalation thus continued till relief is obtained. Semon lays special stress on the importance of persuading the patient to keep calm and remain free from fright and anxiety. For cutting short the spasm he recommends holding the breath for two seconds, and then with tightly shut mouth taking two sharp quick inspirations through the nose. This method will be found exceedingly useful. Bidon has obtained success by compressing the phrenic nerve between the two inferior attachments of the sterno-mastoid muscle. Moritz Schmidt recommends psychical measures, as, for example, pressure on the tip of the nose whilst the patient is told to breathe regularly.

3. Rhythmic Clonic Spasm of the Adductors.—Rapid rhythmical adduction of the cords occurs in association with "nystagmus" of the pharynx, and has already been mentioned under neuroses of the pharynx (p. 472), where it was pointed out that such movements are most commonly due to some grave central lesion, though in rare instances they may be occasioned by some local irritation, such as post-nasal catarrh.

If any local source of irritation can be found it should as far as possible be removed, in the hope of stopping the spasmodic contractions of the pharynx and larynx, but no great hope of success can be held out to the patient.

B. NEUROSES OF CO-ORDINATION

1. Chorea Movements.—Chorea movements of the cords are often associated with general chorea, and somewhat similar movements are occasionally found in disseminated cerebro-spinal sclerosis. Tremor and irregular movements of the cords are, how-

ever, very often noticed quite independently of any more general lesion.

The treatment must be directed against the disease on which the local manifestation depends, when such exists. No local treatment is called for.

2. Nervous Laryngeal Cough.—This consists of a single short, sharp, harsh cough, "the barking cough of puberty" (Sir Andrew Clark). It is repeated at varying and often rhythmical intervals during the day, but generally ceases during sleep, and sometimes by day if the patient's attention is diverted. It is commoner in males than in females, and usually occurs between the ages of sixteen and twenty. It is due to a spasmodic contraction of the adductors, accompanied by a synchronous forcible and spasmodic action of the expiratory muscles, both of which are caused by some irritation simultaneously affecting the laryngeal and respiratory branches of the vagus. There are no other symptoms whatever, either local or general. The cough lasts for long periods, often for years, but finally ceases spontaneously. Instead of a cough a "laryngeal cry" sometimes occurs, to which the above description is equally applicable.

Treatment.—The best method of cutting short this trouble, and one strongly insisted on by Semon, is a sea-voyage. Should this be impossible, ordinary change of air and the administration of bromides in large doses offer the best chance of relief. Arsenic will often be of benefit to young children and large doses of iron in some form to girls at about the age of puberty. Faradism is sometimes useful. Bond reports a case of two years' duration, in which he succeeded in stopping the cough after one application lasting a very few minutes. Some authorities consider that nervous laryngeal cough may be due to intra-nasal or pharyngeal irritation. Whether this be so or not, adenoids and enlarged tonsils, if present, should certainly be removed, and any other abnormalities suitably treated. Occasionally certain small sensitive areas may be found on the nasal mucous membrane, irritation of which with the probe will instantly produce the act of coughing, and if these exist they should be cauterised. Lung gymnastics and lessons in the proper method of breathing are sometimes useful.

3. Phonic Spasm.—This is a spasm of the adductors, induced by attempts at phonation. It nearly always occurs in voice users, and first shows itself by weakness or loss of voice. Later com-

plete spasmoid closure of the glottis occurs on any attempt being made to use the voice professionally ; and it only yields when this attempt is abandoned.

Treatment.—This is most unsatisfactory, and unless the case is seen at its very commencement no good result must be expected. The great essential is to insist on the patient obtaining a prolonged course of lessons in voice production and breathing from a competent teacher. Apart from this the treatment must consist in resting the voice, change of air and scene, the administration of iron and arsenic, and attention to any obvious abnormalities of the larynx, pharynx, or nose.

4. Laryngeal Vertigo.—This is characterised by a tickling sensation in the larynx, inducing cough, followed by spasm of the glottis and by momentary loss of consciousness, which is sometimes sufficiently prolonged to cause the patient to fall. Recovery is complete in a very few seconds, and the attack is not followed by stupor or any other symptom suggestive of epilepsy. It occurs in people of unstable nervous system. Its pathology is very doubtful.

Treatment.—Local abnormalities such as chronic laryngitis, tracheitis or rhinitis, if present, must be treated in the ordinary way. The general health and hygienic conditions should be attended to and bromides administered. Good results are said to have been obtained by the daily administration of antipyrin in 20 to 40 gr. doses, but such doses are hardly safe.

Laryngeal Paralysis

General Etiology.—Paralysis of the muscles of the larynx may be due to :—

1. Diseases of the nerves.
2. Diseases of the muscles.
3. Functional or hysterical disturbances.

1. Diseases of the Nerves.—Disease occurring in any portion of the motor nerve tract may produce paralysis. Thus it may be due to :—

(a) Cortical lesion, or diseases of the internal capsule. Paralysis of this origin, however, is very rare, except as a functional disorder, for, as already pointed out, the centre in each hemisphere has a bilateral action, and it is very unlikely that both cortical centres would be simultaneously affected by any organic lesion.

- (b) Degeneration of or pressure on the vago-accessory nuclei in the medulla.
- (c) Pressure on or destruction of the fibres of the spinal accessory nerve before their junction with the vagus.
- (d) Any lesion of the vagus, or its superior or recurrent laryngeal branches.
- (e) Inflammation of the peripheral endings of the nerves.

2. **Diseases of the Muscles.**—Simple acute or chronic laryngitis may involve the muscles and cause weakening or abolition of their action, as may also syphilis, tuberculosis, and malignant disease. As a rule the adductors and tensors are the muscles affected, but occasionally malignant disease of the oesophagus may spread to the crico-arytenoidei postici, and cause abductor paralysis. These muscles may also be injured by the swallowing of foreign bodies.

3. **Functional or Hysterical Disturbances** generally cause abductor or tensor paralysis, but in certain cases there may be some limitation of abduction.

Bearing in mind these general etiological factors, it is convenient, when considering paralysis in detail, to discuss them according to the individual muscles or groups of muscles affected. Thus they may be first divided into paralysis (A) of muscles supplied by the recurrent laryngeal nerves, and (B) of muscles supplied by the superior laryngeal nerve. Under division (A) the following conditions will have to be considered:—

- (1) Bilateral abductor paralysis.
- (2) Unilateral abductor paralysis.
- (3) Complete paralysis of recurrent laryngeal nerves.
- (4) Adductor paralysis.
- (5) Paralysis of arytenoideus.
- (6) Paralysis of internal tensors.

And under division (B) Paralysis of the external tensors of the cords and of the epiglottidean sphincters.

A. PARALYSIS OF MUSCLES SUPPLIED BY THE RECURRENT LARYNGEAL NERVE

Bilateral Paralysis of the Abductor Muscles (Crico-arytenoidei Postici).—**Etiology.**—This form of paralysis may be either neuropathic or myopathic in origin. In *neuropathic* cases the lesion may be (1) central, as in tabes, bulbar paralysis, or

disseminated cerebro-spinal sclerosis; (2) in the course of the nerves, and due to pressure on both the pneumo-gastric, or both the recurrent laryngeal nerves, such as may occur in aneurysm of the arch of the aorta, cancer of the oesophagus, enlargement of the glands, and bronchocele; (3) peripheral or toxic, following typhoid fever, influenza, and diphtheria, and occasionally rheumatic fever, pneumonia, and scarlet fever, or resulting from poisonous doses of lead, arsenic or atropine. The *myopathic* cases are generally due to extension of disease from neighbouring structures, or to injury during deglutition. Bilateral abductor paralysis is commoner in men than in women, and is practically confined to adult life, though cases occurring in infants are reported.

Pathological Changes.—In all progressive lesions producing this



FIG. 216.—Double abductor paralysis during inspiration.

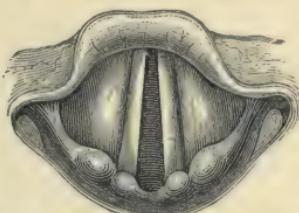


FIG. 217.—Double abductor paralysis during forced expiration.

form of paralysis the cords first show diminished power in abduction, not separating beyond the cadaveric position even on deep inspiration. In the later stages, when all power of abduction is abolished they remain in the middle line in the position of phonation owing to contracture of the unopposed adductors. During inspiration the cords are very often drawn towards the middle line and separate to a slight degree during expiration (Figs. 216 and 217).

Symptoms.—The chief symptom is a gradually increasing inspiratory dyspnoea, at first only noticeable on exertion, but in the course of months or perhaps even years becoming continuous and dangerous. As the case advances inspiration becomes stridulous especially at night, and is accompanied by marked dilatation of the nostrils, recession of the soft parts below the cords, and up and down movements of the larynx during respiration. The dyspnoea may at any time become serious should the patient contract a cold, or should the cords be irritated in any other way, and often bad attacks occur during sleep without any obvious cause.

Diagnosis.—When there is contracture of the adductors and the cords are fixed in the middle line, double abductor paralysis must be distinguished from bilateral ankylosis of the crico-arytenoid joint and bilateral spasm. For the diagnostic points of value between paralysis and ankylosis, see p. 534. Spasm of the adductors is of short duration, and between the attacks abduction is perfect. In some cases of inspiratory spasm due to perverted action of the vocal cords (p. 188), there may be some doubt as to the diagnosis. In this condition, however, it is generally possible to obtain perfect abduction during the laryngoscopic examination, by making the patient repeat "ee" continuously until the breath is exhausted, when a deep inspiration will be taken and the cords will fly widely open.

Prognosis.—The prognosis depends upon the cause. If due to degenerative changes in the central nervous system or to gradually increasing and irremovable pressure on the nerves, the local condition is incurable, though impending death from suffocation may be prevented by tracheotomy. In recent cases due to toxic neuritis the prognosis is better, and in myopathic cases recovery may be anticipated when it is due to trauma or other passing causes.

Treatment.—This must be directed towards the relief of the causal condition, the local paralysis, and the dyspnoea.

(i.) *The Causal Condition.*—In cases of *neuropathic* origin, if the lesion is central, iodide of potassium should be tried, for whether the paralysis is due to tabes, disseminated sclerosis, or bulbar paralysis, syphilis is more than probably the original cause of the disease. If the lesion is due to pressure on the nerves, operative or medicinal treatment must be adopted according to its nature. In cases of *toxæmic* origin due to lead or arsenic poisoning, morning doses of sulphate of magnesium and sulphuric acid should be administered followed by increasing doses of iodide of potassium. If the condition is a sequel to diphtheria, typhoid, influenza or other fever, strychnine and iron should be administered, and change of air and a liberal nourishing diet advised. In *myopathic cases* due to injury, local rest must be obtained by keeping the patient quiet in bed and prohibiting all talking, while local sedatives such as the Vapor Tincturæ Benzoini should be used every four hours. If due to acute catarrh similar treatment is indicated, and if of rheumatic origin the internal use of salicylate of soda should be added to the treatment. If due to the abductor muscles being involved in syphilitic lesions, iodide

of potassium is indicated, and should be given freely, combined with mercurial inunctions if necessary (p. 156).

(ii.) *The Local Paralysis.*—Local treatment is but seldom of much avail. In some few cases of toxæmic or myopathic origin, the hypodermic injections of strychnine, commencing with $\frac{1}{30}$ gr., and gradually increased to $\frac{1}{10}$ gr., used daily in the neighbourhood of the larynx, are sometimes useful. The direct application of galvanism to the affected muscles has also been recommended, but the method causes considerable distress to the patient, and is of very doubtful advantage. It is carried out by means of Mackenzie's laryngeal electrode, to which the positive pole is attached, whilst the negative pole is attached to a metal plate fixed to the back of the neck by means of a strap. The laryngeal electrode is passed into the laryngo-pharynx under the guidance of a laryngoscope, and, the circuit being completed by pressing the ivory handle, it is drawn up and down on either side, so as to bring it into contact with the abductor muscles situated on the posterior surface of the cricoid.

(iii.) *The Dyspnæa.*—Tracheotomy will generally become necessary sooner or later for the relief of dyspnœa, but it is often very difficult to decide exactly when it should be done. If the patient has once had a bad attack of suffocation he is always liable to recurrences, any one of which may prove fatal. Under these circumstances there is no doubt that the operation should be performed without delay. If, on the other hand, the patient is breathing with comparative comfort night and day and no attacks of acute dyspnœa have occurred, he may go on for years without any serious inconvenience. Nevertheless he is always safer when once a tracheotomy tube has been introduced, for an acute attack may occur at any moment, and may prove fatal. Consequently it is always better to advise operation whenever there is any dyspnœa. Patients, however, often object to undergo an operation, the necessity for which has not been forced upon them, and under these circumstances the risks and dangers of their position must be put very clearly before them, and it must be left to them to decide the question. Occasionally when the disease is rapidly advancing the necessity for tracheotomy may possibly be avoided by the occurrence of paralysis of the arytenoideus muscle and the internal tensors. When these succumb the triangular or elliptical space produced will give sufficient room for breathing even during spasm of the adductors.

When the paralysis is due to pressure on the recurrent laryngeal nerve, there may also be pressure on the trachea or bronchi which will greatly increase the dyspnoea. The existence of this pressure can sometimes be surmised by the expiratory difficulty being as great as the inspiratory. In such cases the tracheotomy should be performed as low as possible, in the hope of being able to pass a tube through and beyond the obstruction.

Division of one of the recurrent laryngeal nerves, so as to cause a complete unilateral recurrent paralysis, has been carried out as a method of treatment, and the advisability of thyrotomy and the excision of the cords has also been considered, but tracheotomy is preferable.

Unilateral Abductor Paralysis.—**Etiology.**—Both neuro-pathic and myopathic cases occur. Of the neuropathic variety by far the commonest cause is pressure on one of the vagi or recurrent laryngeal nerves, either by aneurysm, malignant disease of the oesophagus, mediastinal tumours, goitre, gummata, or enlarged glands. The left recurrent, owing to its longer course and relationship to the aorta, is especially liable to pressure, but the right is sometimes compressed by aneurysms of the innominate and sub-clavian arteries, and is occasionally entangled in pleural thickenings at the apex of the lung (p. 174). Unilateral paralysis may also be due to central lesions, as in tabes, but then it generally becomes bilateral in the course of time. It is also not uncommonly due to toxæmic peripheral neuritis, as in diphtheria, influenza, or typhoid, or in lead and arsenic poisoning. Cases of myopathic origin occur as the result of injury, or in the course of acute and chronic inflammatory affections.

Pathological Changes.—In early stages defective outward movement of the affected cord may be observed, but later it is fixed and motionless in the middle line.

Symptoms.—As long as the disease remains unilateral and is restricted to the abductors, there are practically no symptoms, with the exception of some loss of vigour and flexibility of the voice, and possibly a little shortness of breath on exertion.

Diagnosis.—Complete recurrent paralysis, in which the cord is in the cadaveric position, and ankylosis of the crico-arytenoid joint (p. 534), are the conditions from which unilateral abductor paralysis must be differentiated.

The Prognosis entirely depends on the cause. It is hopeful in myopathic conditions, in cases due to neuritis or to syphilis, or

where the source of pressure can be removed, as in goitre. It is bad when the paralysis is of central origin, or when secondary to aneurysm or malignant disease. Unilateral abductor paralysis does not itself endanger life, but the disease on which it depends may be eventually fatal.

The Treatment is in every way similar to cases of bilateral paralysis, with the exception that the question of tracheotomy does not arise.

Complete Paralysis of the Recurrent Laryngeal Nerves.—

Definition.—Paralysis of all the muscles supplied by the recurrent laryngeal nerves on one or both sides of the larynx.

Etiology.—This condition is merely a further stage of abductor paralysis. It has been pointed out that in diseases of central or peripheral origin, or in paralysis due to pressure on the nerve trunks, Semon's law holds good, that is, the abductors are the first to succumb; but should the disease progress, or the injury to the nerve continue, the arytenoideus, the internal tensors, and the adductors will sooner or later follow in their train, and the final result will be complete paralysis of all the muscles supplied by the recurrent laryngeal nerve on one or both sides of the larynx. Unilateral cases are fairly common, but bilateral cases are rare. The causes of bilateral and unilateral abductor paralysis are naturally also the causes of bilateral or unilateral complete recurrent paralysis, and therefore they need not again be enumerated.

Pathological Changes.—In unilateral cases the affected cord is seen to have assumed the cadaveric position. Its inner edge is

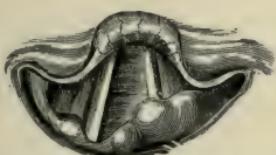


FIG. 218.—Complete paralysis of the left recurrent nerve, as seen during inspiration.



FIG. 219.—The same during phonation. The right arytenoid is seen to pass in front of the left and the right cord to pass beyond the middle line.

usually concave from paralysis of the tensors, the tip of the vocal process of the arytenoid cartilage is very prominent, and the cord is quite motionless. The opposite cord is taut and active, which gives the larynx an asymmetrical appearance. On phonation the healthy cord crosses the middle line, and generally succeeds in coming into apposition with the paralysed cord, the arytenoid cartilage passing in front of and often pushing aside that on the

paralysed side (Figs. 218 and 219). In bilateral cases both cords are concave on their free borders and lie motionless in the cadaveric position, and they make no effort at approximation on attempted phonation. Cases are often seen in which one cord shows complete, and the other only abductor paralysis.

Symptoms.—In unilateral cases there are but few symptoms. There is no dyspnoea, and, if the active cord succeeds in approximating with the paralysed one, the voice, though wanting in power and flexibility, is not lost. In bilateral cases the voice is almost entirely lost, and in addition there is a certain amount of dyspnoea on exertion, but never anything serious. Owing to inability to close the glottis, food or liquids may enter the trachea and bronchi, and cause violent but ineffectual coughing. This accident is not uncommonly followed by septic pneumonia or bronchitis.

Diagnosis.—It is sometimes difficult to decide whether the paralysis is complete on both sides, or whether on one side the abductors only are affected. Careful observation of the position of the cords in relation to the middle line will decide the question. Fixation due to ankylosis must also be excluded (p. 534).

Prognosis.—When the paralysis has become complete there is no hope of recovery. Should the patient contract any lung trouble the outlook is especially grave owing to the impossibility of coughing up the secretions.

Treatment.—This must be directed entirely towards the cause of the paralysis (see Abductor Paralysis, p. 548). No local treatment is of any avail.

Adductor Paralysis (including Functional Aphony).—**Definition.**

—Paralysis of the crico-arytenoidei laterales and the arytenoideus usually accompanied by paralysis of the thyro-arytenoidei.

Etiology.—Paralysis of the above muscles alone, apart from preceding abductor paralysis, is always either functional or myopathic in origin, and the two chief causes are therefore hysteria and acute laryngitis. Though functional paralysis may occur in apparently healthy individuals it is usually met with in neurasthenic, anaemic or phthisical girls, and occasionally in overworked men or even in quite young children. The condition is often ascribed to some sudden emotion such as fright, or to mental or physical shock, but there is frequently some excuse for the functional paresis, such as recent acute or chronic laryngitis or pharyngitis. In many instances, however, the onset is often quite sudden and without ascertainable cause.

Pathological Changes.—On examining a purely functional case of adductor paralysis one of three conditions may be seen, namely, (1) The cords may remain in the position of quiet respiration and make but little, if any, attempt to approximate on phonation; (2) the cords may move towards the middle line but fail to meet on attempted phonation (Fig. 220); or (3) the cords meet, but immediately fly apart again without the production of any audible sound. In addition to one of the above phenomena, the free borders of the cords may be more or less concave in shape from paresis of the tensors. Occasionally there is also partial anaesthesia of the mucous membrane of the larynx and sometimes of the pharynx. In myopathic cases there are the signs of a recent acute laryngitis such as redness and thickening accompanied by a sluggish and ineffective action of the cords.

Symptoms.—In functional cases the chief symptom is complete aphonia. This is quite sudden in its onset and often disappears as suddenly as it commenced. Whilst the aphonia is complete in speaking, the patient can generally cough or laugh quite naturally. Allied to simple functional aphonia, two other conditions have been described, namely, apsithyria and functional mutism. In apsithyria the patient may be able to speak but cannot whisper, and in functional mutism the patient can neither speak, whisper, nor articulate. In myopathic cases the voice is not as a rule entirely lost, but is hoarse and weak and produced with effort. In some instances the true cords are rested and the ventricular bands are brought into play to produce, so to speak, a hoarse audible whisper.

Prognosis.—The existence of adductor paralysis in no way affects the general well-being of the patient, though it is liable to recur and often proves troublesome in treatment. In giving a prognosis, however, the condition underlying the functional aphonia must not be overlooked, and especially must it be remembered that this affection is not at all uncommon in young girls either predisposed to, or actually suffering from, incipient phthisis.

Treatment of Functional Adductor Paralysis.—This must be both general and local.

The General Treatment is very important, and often in itself suffices to cure cases of purely functional origin. Seeing that anaemia and neurasthenia generally underlie this particular mani-



FIG. 220.—The position of the cords during an attempt at phonation in functional aphonia.

festation of hysteria, iron combined with strychnine should be given. The strychnine should be gradually increased in strength from $\frac{1}{30}$ gr. to $\frac{1}{10}$ gr. three times a day, provided no symptoms of poisoning supervene. Combined with this, good nourishing diet of an easily digested nature, plenty of fresh air, and congenial surroundings should be insisted on. A cold shower bath every morning is often very useful, but must only be used if it is followed by a healthy reaction. Otherwise cold douching of the throat followed by friction and massage should be tried. In severe cases a change of air to the seaside or a sea voyage should be advised, whilst in very obstinate cases a course of Weir-Mitchell treatment is often the only way of improving the general and local conditions.

Local Treatment.—In the milder cases the simple use of the laryngoscope combined with suggestion is often sufficient to restore the voice. The laryngoscopic mirror should be introduced and the patient persuaded to say "e" audibly, and directly this is accomplished the mirror should be withdrawn and the patient encouraged to speak. If this is not sufficient, the mirror must be introduced again and again until the patient can count up to ten in an audible voice. It is sometimes of advantage to irritate the back of the pharynx purposely.

If these methods are not successful, the introduction of a brush saturated with perchloride of iron paint (p. 40) should be tried, either at the same or at a subsequent sitting. This will often at once restore the voice and the patient will go away talking naturally. If however this fails or relapses occur, the larynx should be painted with astringents either daily or on alternate days. Perchloride of iron (120 gr. to 1 oz.), chloride of zinc (20 gr. to 1 oz.), or copper sulphate (15 gr. to 1 oz.) may be used, and it is often well to change from one to another every few days. After each painting the patient must be encouraged to phonate and count audibly, and thus the voice must be gradually coaxed back.

If in spite of this treatment the patient remains aphonic, the question of the use of the Faradic battery must be carefully considered. There are two methods of using the battery in functional aphonia ; it may be employed to stimulate the muscles gently and increase their tonus, or it may be used with the object of producing a violent shock accompanied by spasm of the vocal cords and a cry of distress. An immense amount of harm may be done by injudicious use of the latter method ; the aphonia may

be increased and rendered most intractable, and the patient morally injured by repeated subjection to what seems brutal violence and torture.

The gentle method may be employed carefully in nearly any case which is not progressing favourably. The application is made either externally or internally, but the former is the better plan, at all events at first. One pole is placed at the back of the neck whilst the other is brushed over the muscles of the larynx. The strength of the current is at first so regulated as not to cause distress, but increased daily if possible. In this way the voice can often be restored, but if no progress is being made the endo-laryngeal electrode (Fig. 221) may be tried. It is especially

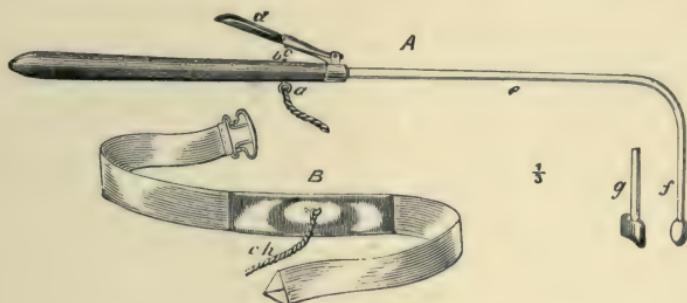


FIG. 221.—Mackenzie's endo-laryngeal electrode.

important to start with a very weak current, as the intra-laryngeal structures are very sensitive. Its effect should be most carefully watched and the method abandoned if it causes much distress to the patient or seems to be deleterious.

The more violent method is certainly sometimes efficacious in effecting a cure, but it should be used in purely functional cases occurring in the robust type of patient, and never in weakly or debilitated subjects. Even in the strong, if one or two applications are unsuccessful, it had better be abandoned. The object being to produce a sudden and severe shock, the endo-laryngeal electrode is used, and the strength of the current should be amply strong enough for the purpose. The patient is told previously that the voice will return on the occurrence of the shock, and it is well to have a friend present to hear the voice. It is true that, if a sufficiently violent shock be administered, audible phonation will usually take place; but if the case is not well selected a relapse is likely to occur directly the patient is outside the surgeon's house,

and each time such a relapse takes place the condition becomes more and more obstinate.

Other methods such as galvanism, the static current, or massage of the larynx externally may be tried ; but if after a due amount of treatment the aphonia persists, it is better to give up all local measures, which are likely to concentrate the patient's attention on the larynx, and to advise change of air. Eventually the voice will probably return as suddenly as it disappeared.

Lastly, having corrected as far as possible any derangements of the general health and having restored the voice, the upper parts of the respiratory tract should be carefully examined for any conditions which might cause or keep up chronic catarrhal laryngitis or irritation of any sort. Although these cases are undoubtedly functional, there is generally some peg in the shape of a slight abnormality on which the excuse for the aphonia can be hung, and relapses are likely to occur as long as that abnormality remains. The nose and naso-pharynx should therefore be carefully treated if any morbid conditions are found. After the voice has been restored, relapses may sometimes be prevented by lessons in breathing and in voice production.

Treatment of Myopathic Adductor Paralysis.—The treatment of myopathic cases is the same as for the later stages of acute laryngitis, and consists in the use of stimulating inhalations and astringent paints or sprays, and, in obstinate cases, in the use of the Faradic battery (p. 488).

Paralysis of the Arytenoideus.—**Etiology.**—Paralysis of this muscle is generally of myopathic origin, but occasionally it is singled out in hysteria. Of the myopathic causes, acute and chronic catarrh, injuries during deglutition, and sometimes tuberculosis, must be mentioned.

Pathological Changes.—The appearance is characteristic. The anterior two-thirds of the cords come together on phonation, but there is a triangular opening left at the posterior part of the glottis (Fig. 222). This is often accompanied by signs of catarrh, either sub-acute or chronic.

Symptoms.—The chief symptoms are hoarseness and weakness of voice.

Paralysis of the Internal Tensors or Thryo-Arytenoidei.—**Etiology.**—The causes are precisely similar to the preceding variety, except that over-use of the voice must be added, as being one of its commonest causes.

Pathological Changes.—When the internal tensors are paralysed, the edge of the affected cord becomes concave, so that if both sides are affected an elliptical gap is left between the cords on phonation (Fig. 223), and the edges of the cords can also be seen to vibrate coarsely from want of tension.

Symptoms.—Hoarseness and weakness of the voice are again the chief symptoms, and they are often sufficiently severe to render the use of the voice for professional purposes impossible.

Prognosis.—As a rule complete recovery results, but in voice-users who will not rest, recovery is often long delayed and sometimes permanent damage is left.

Treatment.—The treatment of this and of the preceding varieties must be on exactly similar lines to that of adductor paralysis, and



FIG. 222.—Paralysis of the arytenoideus muscle.



FIG. 223.—Bilateral paralysis of the internal tensors.

must be varied according as the condition is chiefly myopathic or hysterical. In the case of voice-users with paralysis of the internal tensors, complete local rest is a most important adjunct to the treatment there described. Lessons in voice production are also of the greatest importance both as a curative and preventive measure.

B. PARALYSIS OF MUSCLES SUPPLIED BY THE SUPERIOR LARYNGEAL NERVE

1. Paralysis of the External Tensors.—**Definition.**—Unilateral or bilateral paralysis of the crico-thyroid muscles.

Etiology.—This rare affection is generally a sequel of diphtheria, though pressure on, or injury to, the nerves may be its cause.

Pathological Changes.—When bilateral, the edges of the cords have a wavy outline (Fig. 224); and when unilateral, the affected cord looks slack as compared with its fellow, and is situated on a higher level. If the lesion is above the division of the superior laryngeal nerve into its external and internal branches, there will be loss of sensation accompanying these alterations.

Symptoms.—The voice is rough and uneven and has a want of power and modulation.

Prognosis.—If there is loss of sensation the prognosis is serious, for food is liable to gain access to the lungs and to set up pneumonia. The chances of recovery from the paralysis depend upon its cause. In diphtheritic cases recovery is the rule.

Treatment.—Strychnine should be given in increasing doses when the paralysis is due to diphtheria, and if syphilis is even a



FIG. 224.—Bilateral paralysis of the external tensors.

possible cause, iodide of potassium combined with mercury should be administered. Locally counter-irritation over the larynx and faradisation should be employed. If food enters the larynx, tube feeding should be adopted till the anaesthesia passes off (see *Anæsthesia*, p. 559).

2. Paralysis of the Sphincters of the Epiglottis.—If there is complete paralysis of the superior laryngeal nerve, these muscles will be paralysed as well as the external tensors. The consequent interference with the movements of the epiglottis increases the chance of food passing through the larynx during deglutition, and so adds to the risk of pneumonia. The treatment is the same as for paralysis of the external tensors.

II. NEUROSES OF SENSATION

1. Anæsthesia.—Etiology.—The commonest cause of anæsthesia of the larynx is peripheral neuritis of the superior laryngeal nerve, and it is most frequently a sequel of diphtheria. It may have a central origin and be met with in bulbar paralysis, in tabes, or general paralysis; and lastly, it may be due to direct injury to the superior laryngeal nerve. Hysteria is stated to be a cause, but in such cases the anæsthesia is generally only partial.

Symptoms.—There is a certain amount of difficulty in swallowing owing partly to the anæsthesia and partly to a paralysis of the depressors of the epiglottis which are supplied by the superior

laryngeal nerves. Food is extremely liable to enter the larynx, and as it passes beyond the insensitive area to produce cough. Objectively it is found that a probe can be passed into the larynx and the mucous membrane irritated without the production of any reflex coughing or retching.

Prognosis.—When of central origin, the prognosis is extremely bad; but when due to peripheral neuritis, recovery usually takes place in the course of five or six weeks. There is always a risk of death from pneumonia due to the entrance of food into the lungs.

The Diagnosis is made from the symptoms and especially from the insensibility of the larynx to the probe.

Treatment.—The general treatment consists in the administration of iron and strychnine, the latter in increasing doses. Sometimes a more rapid effect can be obtained by injecting the strychnine hypodermically, commencing with $\frac{1}{30}$ of a grain and cautiously increasing it up to $\frac{1}{10}$. Where the cause of the anaesthesia is likely to be of syphilitic origin, iodide of potassium and mercury should of course be given. If the anaesthesia is complete, and if the depressors of the epiglottis are involved, precautions must be taken to prevent food entering the larynx. The prone position as recommended for dysphagia (p. 124) should first be tried, but if this is not efficacious, tube feeding must be resorted to. Great care must be taken not to pass the tube into the trachea, which may easily happen when the mucous membrane is insensitive. The tube should therefore be guided well backwards with the finger introduced through the mouth, and when it is in position the patient should be made to speak so as to make sure that phonation is not interfered with. This should always be done before introducing the food through the tube.

Locally the use of the Faradic and galvanic currents is most useful. They should be employed alternately every other day, and should be of sufficient strength to be disagreeable, but not strong enough to cause pain. One terminal should be placed on the side of the neck over the course of the nerve, whilst Mackenzie's endo-laryngeal electrode should be introduced through the mouth and placed in the anterior portion of the pyriform fossa as near as possible to the course of the superior laryngeal nerve. Each application should last for five minutes.

2. Hyperæsthesia and Paræsthesia.—*Definition.*—By hyperæsthesia is meant an exaggerated sensitiveness of the larynx, and

by paraesthesia is meant perverted sensations in the larynx without objective cause.

Etiology.—These conditions occur chiefly in neurotic and neurasthenic women, and are often associated with the abuse of alcohol or tea, with disordered digestion, and the very early stages of pulmonary or laryngeal tuberculosis. Very much the commonest cause, however, is a disordered digestion in a neurotic subject, who is a prey to the fears of cancer, syphilis, or tubercle.

Symptoms.—In hyperesthesia the parts are extremely irritable to the touch, and apart from this there is a sensation of great irritation in the larynx leading to a tiresome and exhausting cough, greatly aggravated by using the voice.

In paraesthesia the patients complain of a lump in the throat or of scalding, tickling, or prickly sensations, as if a foreign body, such as a hair, were present. Objectively the mucous membrane of the larynx is often very anaemic, but in the majority of cases no departure from the normal can be noticed.

Prognosis.—These affections are often most persistent and the results of treatment very discouraging. The possibility of their being premonitory symptoms of phthisis must always be remembered.

Treatment.—The general treatment should be directed towards the disorders on which the local condition seems to depend. Errors of digestion must first be corrected by appropriate remedies and dieting, and the use of alcohol, strong tea, and tobacco must be prohibited. In neurotic patients bromide of potassium should be exhibited, and in anaemic and neurasthenic conditions the following prescription is serviceable given three times a day half-an-hour after food :—

R.	Citrate of iron and ammonia	.	.	.	10 gr. = 0.69 gm.
	Solution of arsenic	.	.	.	3 m. = 0.19 c.c.
	Valerianate of zinc	.	.	.	1 gr. = 0.065 gm.
	Spirit of chloroform	.	.	.	10 m. = 0.62 c.c.
	Compound tragacantha powder	.	.	.	5 gr. = 0.34 gm.
	Water	.	.	.	to 1 oz. = 30 c.c.

When no special indications exist, tonics, sea-bathing and cold sponging, regulated outdoor exercise, and local massage should be employed. Change of air is often very useful, and if there is any gouty tendency, Carlsbad, Kissingen, or Aix-les-Bains may be especially recommended for their waters.

These troubles are very intractable especially in nervous people

who fear some grave disease. Too much must not be promised, but much may often be done by gaining the patient's confidence, and then strongly assuring him that there is no fear of cancer, syphilis, or tubercle.

The local treatment is usually quite subsidiary to the general, and in many cases a mere placebo, in the shape of a lozenge or a gargle, is all that is called for. In persistent cases, however, the local application of the constant current is often of service, the positive pole being applied to the larynx, and the application continued for four or five minutes. As an alternative, painting the larynx twice or three times weekly with astringents, such as perchloride of iron (120 gr. to 1 oz. of water) or chloride of zinc (20 gr. to 1 oz.), may be carried out with advantage. Great relief may be given to the symptoms by means of a menthol spray (10 or 15 gr. to 1 oz. of paroleine) used three times daily.

3. Neuralgia.—**Definition.**—Pain in the larynx often shooting down the neck to the collar bone, and sometimes to the shoulders.

This affection is rare without some obvious exciting cause, such as a new growth or tuberculosis, but it has been noted as occurring in malaria, and it is also met with in rheumatic or gouty subjects.

Treatment.—General treatment is more important than local, and is carried out on the same lines as for neuralgia in other regions. Locally, the internal application of the constant current and the external application of the camphor and chloral liniment are useful. The current is applied daily for a few minutes only, and between the sittings the patient should use a spray of menthol in paroleine (10 gr. to 1 oz.). The liniment is painted over the painful part twice a day. If the pain is paroxysmal, the application of very hot fomentations to the neck at the onset of the attack, and the administration of aspirin (10 or 15 gr. in a cachet), will often cut it short or diminish its severity.

The local application of morphia or cocaine has been recommended, and certainly relieves pain. It is, however, always dangerous to accustom a neurotic patient to the use of either of these drugs, which should therefore be used with great caution, and should always be applied by the surgeon himself.

CHAPTER XXV

NEW GROWTHS OF THE LARYNX

I. INNOCENT GROWTHS: *Papilloma*—In Adults—In Children—*Fibroma*—*Myxoma*—*Angioma*—*Chondroma*—*Cyst*—*Lipoma*. II. MALIGNANT GROWTHS: *Carcinoma* and *Sarcoma*—A. Intrinsic—B. Extrinsic—Their Treatment, Operative and Palliative.

I. INNOCENT GROWTHS

PRACTICALLY any of the small tumours met with in other parts of the body may occur in the larynx. Papillomata, fibromata, and cysts are the commonest; but angioma, myxomata, lipomata, and chondromata occur.

Etiology.—Nothing can be stated with any great certainty as regards the etiology of innocent tumours, but there is some evidence to show that persistent local irritation from any source and chronic catarrh are predisposing causes, though they often occur in an otherwise normal larynx. They are commoner in men than in women, and occur almost exclusively in adult life, except in the case of multiple papillomata, which are common in children.

Pathological Changes.—(1) *Papillomata* may be single or multiple, sessile or pedunculated. They are soft in appearance and grey or pink in colour. When single they usually occur on one of the cords, and vary in size from a peppercorn to a hazel nut. When multiple they vary immensely in size, some being mere specks on the mucous membrane, whilst others are large cauliflower-like masses; they may spring from any part of the larynx, but the cords and ventricular bands are their most common situations (see Figs. 225 to 232). In bad cases they extend into the subglottic region, and even to the trachea, and they are often so numerous as almost entirely to fill the larynx.

(2) *Fibromata* occur as single, smooth, round or oval, white or pink, sessile, though occasionally pedunculated, growths springing most usually from one of the cords (Figs. 233 to 235).

(3) *Cysts* are generally met with on the epiglottis, and especially on its lingual surface about the glosso-epiglottic ligaments

(Figs. 236 and 237), but they are also occasionally seen in other regions (Figs. 238 and 239). They are smooth and rounded, grey in



FIG. 225.—Single Papilloma in a child.



FIG. 226.—Multiple Papillomata in a child.

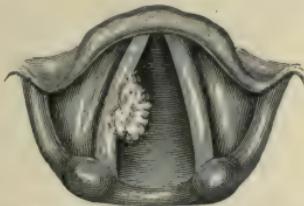


FIG. 227.—Single Papilloma in an adult.

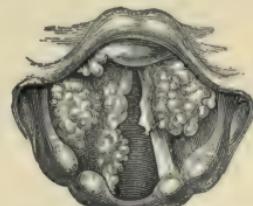


FIG. 228.—Multiple Papillomata in an adult.

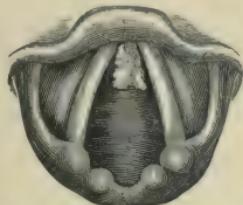


FIG. 229.—A small Papilloma during respiration.



FIG. 230.—The same during phonation.



FIG. 231.—A large Papilloma during respiration.



FIG. 232.—The same during phonation.



FIG. 233.—Fibroma during phonation.

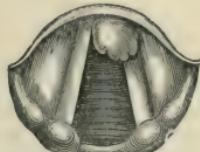


FIG. 234.—Fibroma during respiration.



FIG. 235.—Large Fibroma.

colour, semi-translucent in appearance, and vary in size from a pea to a pigeon's egg. Small vessels may be seen coursing over the surface of the swelling, producing a very characteristic appearance.

On puncture they are found to contain a mucous fluid, though suppuration within the cyst is not uncommon.

(4) *Myxomata* always occur on one of the vocal cords. They are generally smooth, sessile growths, pink in colour and transparent



FIGS. 236 and 237.—Cysts of the lingual surface of the epiglottis.



FIG. 238.—Cyst of the laryngeal surface of the epiglottis.

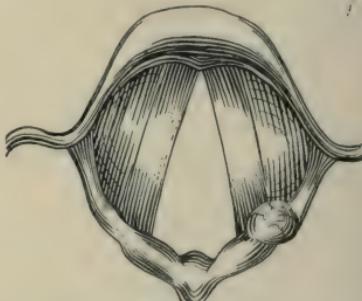


FIG. 239.—Cyst of the aryteno-epiglottidean fold in a woman aged 50, causing no symptoms whatever.

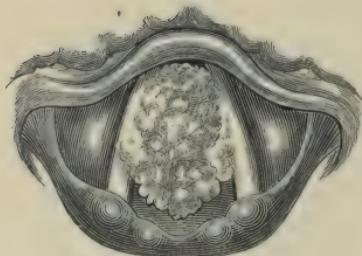


FIG. 240.—Myxoma.



FIG. 241.—Angioma.

in appearance, but they occasionally become pedunculated and multilobular (Fig. 240).

(5) *Angiomata* may spring from the vocal cords, ventricular bands, or epiglottis (Fig. 241). They vary in size, are dark red in colour, and have a great tendency to bleed.

(6) *Chondromata* are usually attached to the cricoid or the thyroid cartilages, but they have been seen in connection with the epiglottis and arytenoid cartilages. They grow very slowly in an inward direction and gradually invade the lumen of the

glottis. They are sessile, somewhat irregular in outline, and covered with injected mucous membrane.

Symptoms.—The most important symptoms are more or less alteration of the voice and dyspnœa, depending on the size and position of the growth. The alterations of the voice range from slight hoarseness to complete aphonia. Dyspnœa is most often met with in children with multiple papillomata, and may be sufficiently serious to call for tracheotomy. In children, moreover, the presence of a growth, though not sufficient to obstruct the air passages mechanically, may set up spasm of a very serious nature. In adults multiple papillomata and chondromata are the most likely growths to cause respiratory trouble. Certain other symptoms may be met with, such as difficulty in swallowing, haemorrhage, pain, and cough. The dysphagia is purely mechanical and generally due to a large cyst on the epiglottis ; haemorrhage is a fairly common symptom in angioma ; pain is generally due to an accompanying laryngitis rather than to the growth itself ; cough is particularly troublesome in papillomata, especially in children. Finally, in children multiple papillomata by producing difficult inspiration may have far-reaching and deleterious effects. Stunted growth, debilitated general health, and deformities of the chest are of common occurrence.

Diagnosis.—The diagnosis is based upon the appearances seen by means of a laryngoscope. It is often extremely difficult to distinguish one form of simple growth from another, as papillomata, fibromata, and myxomata may closely resemble each other. Occasionally it may also be difficult to differentiate between a simple and an early malignant growth of the vocal cords, especially in elderly patients. An innocent tumour is an outgrowth from the cord and does not infiltrate the surrounding tissues and consequently does not lead to fixation, and it seldom ulcerates. A malignant tumour on the other hand is very rarely a definite outgrowth, but rather an infiltration of the cord ; it quickly leads to fixation of the affected side of the larynx and eventually ulcerates. In doubtful cases it may be necessary to resort to microscopical examination of a portion of the growth before a definite diagnosis can be made (p. 578).

Prognosis.—The prognosis must be considered from three points of view, that of life, that of the voice, and that of recurrence. As regards *life*, the prognosis in adults is almost invariably good, though in a case reported by Grünwald death from haemorrhage

followed the removal of a laryngeal polypus. In children multiple papillomata seriously affect their well-being and jeopardise life. Death may occur from sudden dyspnoea, from diseases of the lungs, or from complications due to tracheotomy. As regards the *voice*, the prognosis is good in adults suffering from a single growth. In cases of recurrent multiple papillomata both in adults and children the chances of thorough recovery of the voice are not so good, but with time, patience, and careful treatment it may eventually be restored to a great extent. As regards *recurrence*, the prognosis is good except in multiple papillomata, which both in children and adults almost invariably recur time after time, but eventually this tendency to recurrence diminishes and there are fair prospects of an ultimate recovery.

Treatment.—If a small innocent growth is so situated as not to interfere with the functions of the part, it may be left alone. As a rule, however, symptoms will develop sooner or later which will necessitate surgical interference. The exact method will vary to some extent with the nature and position of the growth.

Treatment of Papillomata.—(1) **In Adults.**—Papillomata should be removed through the mouth by means of forceps or

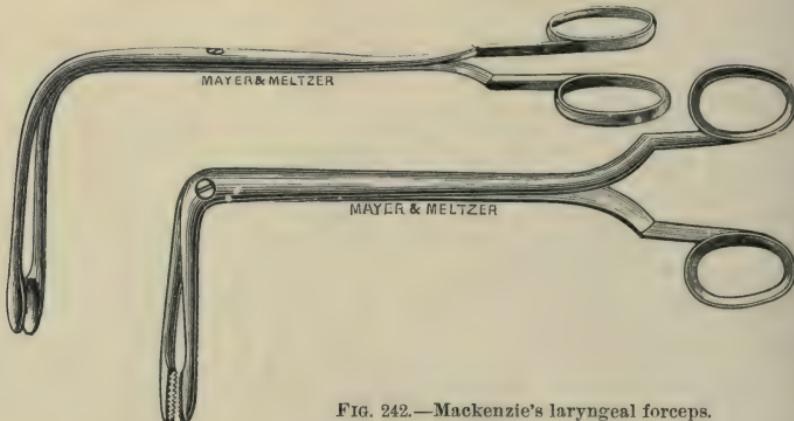


FIG. 242.—Mackenzie's laryngeal forceps.

snare. Forceps are by far the most generally useful and satisfactory, but occasionally, if the growth is large and pedunculated, it may be found easier to pass the loop of the snare round the pedicle, and thus remove it. Mackenzie's forceps, or some variation of them, are very serviceable. They are made to open either antero-posteriorly or laterally, and they can have either cutting or serrated blades (Fig. 242). Each variety is made in several sizes, so that

most cases can be dealt with by their means. In special cases, however, Grant's (Fig. 207, p. 520), Krause's (Fig. 75, p. 114), and Watson Williams' laryngeal forceps (Fig. 243) are of great value. The difficulty of the operation varies inversely with the self-control and adaptability of the patient. In irritable subjects it is sometimes necessary to train the patient by cocaineising the larynx and introducing probes before actually attempting the removal of the growth.

Method of Operation.—The advantages of ambidexterity, which enables the surgeon to use his right hand for a growth on the patient's right, and his left hand for one on the patient's left,

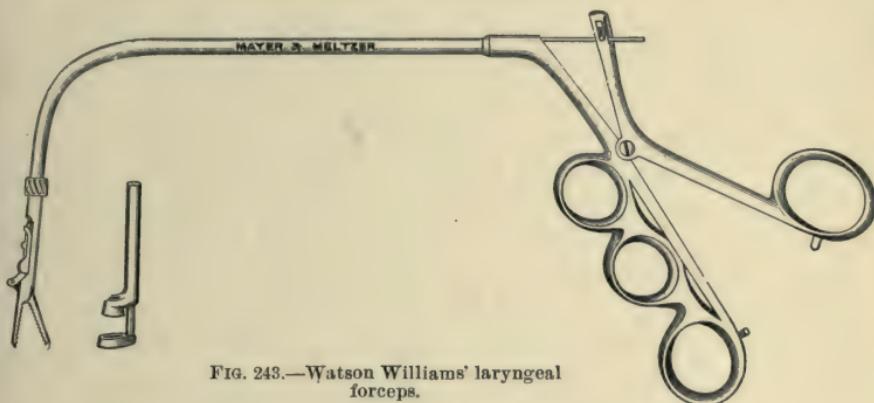


FIG. 243.—Watson Williams' laryngeal forceps.

have already been discussed, and the method of introducing the instrument into the laryngeal cavity has also been dealt with (p. 67). The first step in the actual removal of the growth is to induce a very complete anaesthesia of the larynx, directions for doing which will be found on p. 65. When this has been done, the patient is directed to take charge of his tongue, and a laryngeal mirror is introduced and manipulated until a thoroughly satisfactory view of the growth is obtained. A pair of laryngeal forceps are then guided by the help of the mirror into the larynx and the growth is seized and torn or cut off, according to its softness or hardness of structure. The growth is not always successfully removed on the first introduction of the forceps, but at all events it is possible to judge whether a wise selection of forceps has been made both in shape and length. In using forceps great care should be exercised not to damage healthy mucous membrane. The blades must not be closed unless it can be seen in the mirror that the growth and the growth only will be included. Should healthy

mucous membrane be accidentally grasped, the forceps should be opened and readjusted.

If the growth is large and sessile it may have to be taken away piecemeal, but every portion sufficiently large to be grasped within the blades of the forceps should be removed. If the anaesthesia passes off before this is accomplished, or haemorrhage hides the view, the remainder must be removed at a subsequent sitting. In multiple papillomata one sitting is rarely sufficient, and often three, four, or even more, are necessary before the whole larynx is cleared.

If it is decided that a snare is more suitable to any particular case, it should be introduced in the same manner as the forceps, and the loop worked round the pedicle or base of the growth and quickly tightened so as to grasp it. The attachment of the growth is then severed by tightening the snare more slowly. If the growth seem very hard, which is not often the case in papillomata, a cold snare should not be used, as instances are recorded in which it has refused to sever the growth, and great difficulty has arisen in removing the snare. It is better to use a galvano-cautery snare, but the wire need not be heated unless necessity arises. In such cases, however, it is probably better to remove the growth with strong cutting forceps, such as those of Krause or Watson Williams.

The after-treatment of intra-laryngeal operations is discussed on p. 75. Various applications have been recommended to prevent recurrence, and to shrivel up any growths that may have been left unremoved. Solutions of chromic acid, salicylic acid, lactic acid, perchloride of iron, nitrate of silver, and formalin all have their advocates, but their use is always disappointing, and may cause irritation and so encourage a recurrence.

If large growths are seen below the cords, after the upper parts of the larynx have been cleared, an attempt should be made to reach them by endo-laryngeal methods. If this prove impossible, and they are producing dyspnoea or serious loss of voice, the trachea should be opened just below the cricoid, and, the edges of the wound being held well apart, a small pair of laryngeal forceps is introduced in an upward direction, and the growth removed. Occasionally it may be necessary to split the cricoid in order to effect a complete removal. The wound is allowed to close at once. The operation, if properly carried out, is effectual and is practically free from risk.

Other Methods of Treatment.—*Abscission*.—This consists in cutting through the attachment of the growth with a concealed knife, a probe-pointed knife, or small scissors. It is not a method which is often adopted.

Crushing.—In some cases in which the growth is very firm it may be embraced in the blades of a forceps and crushed. The portion so crushed will often slough and separate. This is useful when, in attempting removal with forceps, it is found that too great force would be required to separate it.

Guillotine.—Stoerk uses a special laryngeal guillotine in nearly all forms of growth, and finds it useful.

Sponge.—In cases of multiple small papillomata a sponge firmly attached to a holder has been introduced, and an attempt made to detach the growths by firm rubbing. This haphazard method may cause considerable bruising of the mucous membrane, and cannot be recommended.

Local Applications.—(a) *Chemical Caustics*.—A variety of caustics and other agents have been used for the destruction of laryngeal growths, but with no marked success. Every now and then a case seems to improve, but it is doubtful whether any permanent cure has been effected. In some cases in the course of years the growths have disappeared, but it is probable that they would have done so even without the local application. The use of strong caustics, moreover, is not without danger of acute inflammatory reaction. Amongst those recommended may be mentioned chromic acid or nitrate of silver fused on a probe or applied by means of a hooded porte-caustique, salicylic acid in absolute alcohol 2 to 10 per cent. (Grant), absolute alcohol used as a spray five or six times a day, thuja occidentalis (Watson Williams), and sulphuricinic solution of carbolic acid 30 per cent. (Heryng).

(b) *The Galvano-Cautery*.—This has often been employed for destroying laryngeal growths, but it requires as much skill as removal with forceps or even more, and is attended with appreciable risks of acute and even oedematous laryngitis.

External Operations.—Thyrotomy has been frequently practised for the removal of papillomata, especially when multiple, and occasionally subhyoid pharyngotomy and laryngotomy have been performed for their removal. The supporters of thyrotomy claim that it renders a more thorough operation possible, and that the bases of the growth can be cauterised without fear, thereby greatly

reducing the chances of recurrence. Against these supposed advantages must be placed a certain, though small, risk to life, a considerable chance of permanent damage to the voice, and the fact that recurrences after thyrotomy are quite as common as after intra-laryngeal operations. Semon quotes a case in which the thyroid has been split seventeen times for the removal of multiple papillomata. Seeing that both in children and in adults the tendency to recurrence seems to wear itself out in time, and that the patient can meanwhile be kept comfortable by means of endo-laryngeal operations, thyrotomy should seldom, if ever, be performed.

Treatment in Children.—Papillomata in children are nearly always multiple, and generally cause greater dyspnoea than in adults. The treatment must vary according to the severity of the dyspnoea and the age of the child. Whenever dyspnoea is urgent tracheotomy should be performed at once, and the further treatment left for future consideration. As regards age, if the child is over four years there are good prospects, with great patience, of training him sufficiently to enable the surgeon to remove the growth by endo-laryngeal methods under cocaine. This may take months, but it is well worth the time and trouble, as this method is practically devoid of all risks. The details of the operation are carried out precisely in the manner recommended for adults. In the case of younger children and of those who cannot be trained, other means must be resorted to. If the growths are only causing alteration or even loss of voice, but no appreciable dyspnoea, no treatment should be undertaken. Time alone may occasionally lead to the disappearance of the growths, and in any case the child may wait without suffering much hurt until he reaches an age when they can be removed endolaryngeally. He should, of course, be kept under careful supervision and be treated promptly should any bad symptom arise.

If, however, dyspnoea is present and increasing, the removal of the growths should certainly be undertaken, otherwise stunted growth, deformity of the chest, and damage to the general health will almost certainly occur. The operation is best accomplished under combined local and general anaesthesia, as first recommended by Scanes Spicer. The details are as follows: the child, wrapped in a blanket so arranged as to prevent any movement of the arms, is placed on the operating table and general anaesthesia is induced. He is then transferred to a nurse's knee and held in

the sitting posture. The nurse steadies the child's head against her chest by placing one hand on the forehead, whilst the other hand is passed round the child's chest to prevent him from slipping down. The child's mouth is opened and a gag is inserted and given to an assistant to hold ; the tongue is pulled forward and held in the assistant's other hand, while the soft palate is painted with a 5 per cent. solution of cocaine. A laryngeal mirror is introduced and the larynx painted with cocaine. After a few minutes' pause the removal of the growths with forceps may be commenced. This must be done deliberately, quietly, and with great patience. It is a very tedious performance, but it should be continued for from half-an-hour to one hour in order to clear the larynx completely if the child's general condition permits of it. Occasionally the child becomes collapsed, in which case it is better to desist and repeat the operation another day. This procedure is not free from danger : for, in the first place, the administration of chloroform in the sitting posture is not without risk ; secondly, cocaine combined with chloroform is apt to cause alarming collapse ; and thirdly, if there is any marked obstruction, dangerous dyspnoea may occur at any moment. Cocaine must, therefore, be used very sparingly, and tracheotomy instruments must be ready for use at the side of the operator.

If after clearing the parts above the cords stridor and dyspnoea persist, it is certain that growths exist below the cords. These must be dealt with by a high tracheotomy, and removal by means of forceps through the tracheal opening.

As an alternative to the above method removal of the growths by direct vision by means of Killian's tubes and special forceps (Fig. 244) is recommended. It has now been tried sufficiently often and successfully to prove its value, and it is likely to be used more extensively in the future, as it is safer than removal with ordinary forceps under combined cocaine and chloroform anaesthesia.

Other Methods.—The sponge method as described for adults has also been used for children, but its results are extremely uncertain ; painting with alcoholic solution of salicylic acid or spraying with absolute alcohol are also used, but are of little value. Various other operative methods have been advised for use in children, namely, removal under Kirstein's direct autoscopy, scraping the larynx with the finger nail, removal under chloroform with forceps guided by the finger, tracheotomy alone as a

curative measure, and thyrotomy. As regards autoscopy it is extremely difficult to get a direct view of the whole of the larynx, and it is therefore impossible to make sure of removing all growths. Scraping the larynx with the finger nail is a very rough and ready method, and there are risks of damaging healthy mucous membrane. Removal under chloroform with forceps guided by the finger is only safe after tracheotomy has been performed, and even then it is very difficult to make sure of removing all the growth and to avoid damaging the larynx. Tracheotomy as a curative measure has been strongly recommended, especially by Hunter Mackenzie.

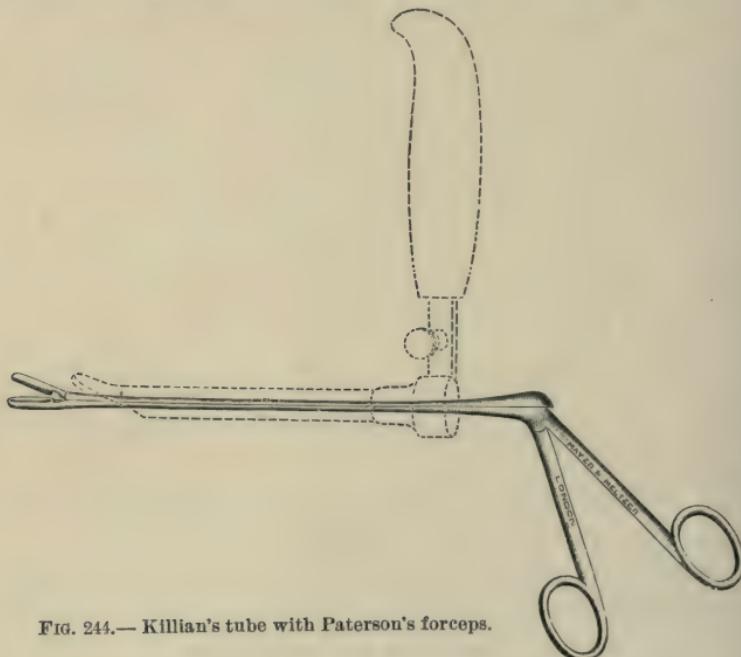


FIG. 244.—Killian's tube with Paterson's forceps.

He maintains that the rest of the parts leads to atrophy and disappearance of the growth, and so to a permanent cure. This point is strongly contested by others, and remains unsettled; but, even if there is the possibility of an ultimate cure, the method is unadvisable, for a child wearing a tracheotomy tube is in constant danger of bronchitis and broncho-pneumonia; moreover, the tube has to be worn often many years, and so may lead to the formation of granulation and scar tissue in the trachea causing obstruction and making the removal of the tube extremely difficult and often impossible without an extensive and troublesome operation. Tracheotomy, therefore, should only be performed in cases of

necessity arising from dyspnoea, after which the growths should, if possible, be removed, and the tracheotomy tube dispensed with as soon as possible. The practice of thyrotomy in children with multiple papillomata causing dyspnoea, is strongly supported by MacBride, as he himself says, in opposition to most authorities. It is not, however, free from danger, it may leave a permanently damaged voice, it is occasionally followed by stenosis, and it by no means ensures final success, as the growths often recur.

General Treatment of Papillomata of the Larynx.—Arsenic has been strongly recommended both as a curative and preventive measure, but it is difficult to trace any direct beneficial result from its use. Watson Williams recommends the exhibition of proto- or bin-iodide of mercury after removal to prevent recurrence. Rest of the voice and avoidance of all sources of local irritation are important.

It was once maintained that operative interference, especially if frequent and unsuccessful, increased the danger of simple neoplasms becoming malignant. This point was carefully investigated and finally settled by Semon, who found, after collecting 10,747 cases, that the chances of malignant degeneration were diminished by operative treatment.

Fibromata must be dealt with on exactly the same lines as simple papillomata. Some sessile fibromata are so hard and resistant that strong cutting forceps must be used, and occasionally mere crushing had better be relied on. If there is little more than a localised fibrous thickening on the edge of a cord it is often wiser to leave it alone, as it is almost impossible to remove it without damage to healthy structures. If the growth is pedunculated, and suitable for removal with a snare, a cautery snare should be selected in case the tissues should prove resistant to the cold wire.

Myxomata should be treated in every way like a papilloma. They are soft and easily removed.

Angiomata.—The removal of an angioma is accompanied by a real and considerable risk of haemorrhage. If, therefore, the growth is small and causes no serious symptom, it is better to leave it alone. If it is giving rise to haemorrhage, the electric cautery should be applied. A suitable platinum point is selected and the heating power of the current tested and adjusted, and the larynx is anaesthetised in the usual manner (p. 165). The cautery point is then introduced cold and applied to the growth, the current is turned on and a small amount of burning done. The point is

allowed to cool and withdrawn. This is repeated at intervals of a week till all chance of haemorrhage seems to have disappeared. As already pointed out, the cautery must be used in the larynx with great care otherwise serious consequences may ensue. If the angioma is large and the haemorrhage severe it may be necessary to do a thyrotomy, and carefully dissect out the growth including a margin of healthy mucous membrane. If complete removal seems impossible it is better not to attempt it, but to destroy the growth by means of electrolysis in the same way as it is used for naevous growths elsewhere.

Chondromata.—These tumours in time often demand tracheotomy to relieve dyspnoea, and when this is the case the thyroid cartilage should be afterwards split, and the growth, together with the cartilage from which it springs, removed. Bosworth recommends the destruction of the growth by the electric cautery when it is seen early and is still small, but this seems hardly advisable.

Cysts.—Simple incision and emptying the cysts is not efficacious, as the fluid is sure to re-collect. Some method by which a considerable portion of the cyst-wall is destroyed or removed must be adopted. If the cyst is on the lingual surface of the epiglottis it may often be possible, by firmly depressing the tongue, to seize it with a pair of catch forceps, and whilst pulling it forward to snip off the greater part of it with long curved scissors. When this is not possible, or when the growth occurs on the laryngeal surface of the epiglottis, it should be opened with a cautery knife, and the opening considerably enlarged by burning. If the cyst is in the deeper parts of the larynx it may be easier and better to remove it, or at all events a large portion of its wall, with Mackenzie's cutting forceps rather than to use the cautery.

Lipomata are best removed with a snare. As they generally occur on the lingual surface of the epiglottis, this can easily be done by depressing the tongue and passing the loop of the snare round the growth by direct vision.

II. MALIGNANT NEOPLASMS

Both carcinomata and sarcomata may affect the larynx, but the former are more frequent. Epithelioma is the most usual variety. Clinically it is not often possible to distinguish between the various forms of malignant growths either objectively or subjectively, and they will therefore be dealt with together.

Etiology.—The exact cause of malignant growths wherever they occur is still undetermined, but their occurrence in the larynx seems to some extent influenced by hereditary tendency, by sex and age, by social position, and by over-use of the voice. It is commoner in males than in females, and usually occurs between fifty and sixty, though practically no age is exempt, and it is more frequently seen amongst well-to-do people. In many instances a history of excessive use of the voice may be obtained.

Pathological Changes.—Malignant growths may be divided into two groups according to their position in the larynx, namely, *intrinsic* and *extrinsic*. These divisions are important, as the course of the growth and its treatment varies considerably in each of them.

(1) **Intrinsic Growths** are those which involve in order of frequency the cords, the ventricular bands, or the ventricles. They are characterised by their comparatively slow rate of growth, and by the fact that there is very little tendency to secondary infection of the glands until late in their course, that is, until the disease has spread to the extrinsic parts of the larynx. Their appearances vary with their position and the duration of the growth.

If the *cords* are affected the disease is at first unilateral, and in the early stages may be seen as :—

- (a) Unilateral congestion with slight localised thickening.
- (b) A small papillomatous outgrowth with a broad attachment and some thickening and injection of the surrounding cord (Fig. 245).
- (c) A small flat indolent ulcer, usually with thickened edges.
- (d) A general infiltration of the cord, which becomes red, thickened, and uneven.

As the disease advances a definite tumour or an extensive infiltration can be seen, with ulceration on the surface and complete fixation of the affected side of the larynx (Fig. 246); or there may be a fringe of papillomatous growth attached to the whole length of the cord. In still later stages the appearances generally become characteristic of an ordinary epithelioma. There is a fungus-like mass of growth, on the surface of which there is a typical ulcer with thickened everted edges, and a dirty grey-coloured secretion covering its base. These typical appearances may afterwards

be lost owing to the occurrence of perichondritis and necrosis (p. 530).

When the *ventricular band* is the original seat of the disease the growth may appear as a definite tumour, but more often there



FIG. 245.—Early epithelioma of right vocal cord.

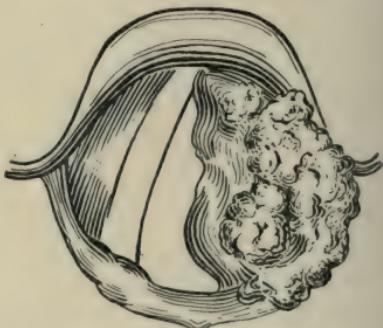


FIG. 246.—Advanced epithelioma of the left vocal cord.

is general thickening of the part, having a greyish-pink colour and a rough, uneven, and sometimes distinctly nodular, surface (Fig. 247). Later, ulceration occurs and the condition becomes typical of epithelioma.

When the growth commences *within the ventricle* it is characterised by a smooth swelling, covered by mucous membrane situated

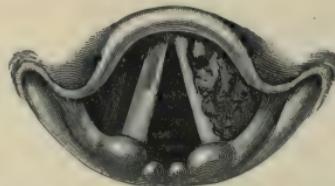


FIG. 247.—Epithelioma of left ventricular band.

above the corresponding cord, which is generally hidden from view. Afterwards the growth ulcerates through the mucous membrane and its appearance quickly become typical.

(2) **Extrinsic Growths** involve the epiglottis, aryteno-epiglottic folds, or the arytenoids, any of which parts may be the original seat of the disease or may be secondarily affected by growths spreading from the pyriform fossæ, the laryngo-pharynx, or the oesophagus. In the very early stages the symptoms are usually not at all pronounced, consequently the growth is generally typical of malignant disease by the time it comes under observation. There is an infiltrating growth with ulceration in its centre, the edges of which are raised, thickened, and everted, and its base is covered

with a dirty grey secretion. They extend rapidly and involve neighbouring structures. The perichondrium is often attacked, and the oedema due to this may hide the original trouble (p. 530).]

Good examples of extrinsic malignant growths are shown in Figs. 248 to 252.

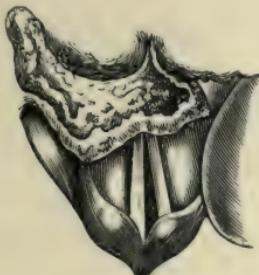


FIG. 248.—Epithelioma of the lingual surface of the epiglottis.



FIG. 249.—Epithelioma of the right aryteno-epiglottidean fold with thickening of the epiglottis.



FIG. 250.—Malignant growth of the epiglottis and aryteno-epiglottidean fold.

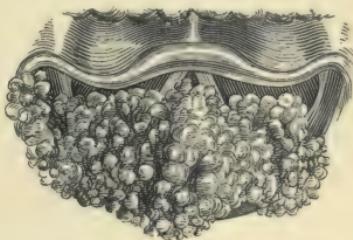


FIG. 251.—A wide-spread malignant growth.



FIG. 252.—Sarcoma growing from the posterior surface of the cricoid cartilage before and after removal (from a case of Sir Morell Mackenzie's).

Growths spreading from the lower part of the pharynx behind the cricoid cartilage require special mention, as they form a distinct class of cases. They occur most frequently in young women from the ages of twenty-seven to thirty-five, who generally apply to the laryngologist on account of slight alteration of the voice, pain, and difficulty of swallowing. In an early case of this

sort the changes are not marked, but they are very typical. They consist in an oedematous swelling of the posterior aspect of the arytenoids accompanied by a profuse secretion of ropy mucus, which hangs about the parts and is extremely difficult to get rid of. Later the edge of the ulcer may be seen peeping up from behind and below the arytenoids, often having a yellow sloughy appearance, whilst later still distinct growth and ulceration can be seen.

In extrinsic cancer infection of the glands nearly always occurs early, and is often very extensive. Often huge hard matted masses of them are found in the neck before the primary growth has advanced sufficiently far to direct the patient's attention to the throat. Pressure on the recurrent laryngeal nerves causing paralysis of the cords is frequently found, but otherwise the movements of the cord are limited only when the arytenoids are affected, or when the growth spreads from the extrinsic to the intrinsic parts of the larynx.

Symptoms.—Intrinsic Growths.—In the early stage persistent and increasing hoarseness may be the only symptom, but it is a very important and suggestive one from the diagnostic point of view. The voice is gruff, harsh, and to some extent muffled; and some discomfort and tenderness can generally be elicited on pressure over the larynx. As the tumour grows there will be gradually increasing dyspnoea, and when ulceration has occurred, there may be entire loss of voice, pain shooting to the ears, hawking, peculiarly offensive breath, and salivation. Later still, especially when the growth has spread to the extrinsic parts of the larynx, dysphagia, cachexia, and marked loss of flesh may occur. Occasionally there may be severe and sometimes fatal haemorrhage from the ulceration spreading into some vessel.

Extrinsic Growths.—As already mentioned the symptoms in quite early stages are not marked, but as the disease generally runs a rapid course, ulceration soon takes place and symptoms will then quickly develop. There is usually a great deal of pain shooting to the ears, dysphagia, foetid breath, and the hawking up of purulent secretions and frothy mucus. Cachexia and loss of flesh occur early and increase rapidly, and occasionally dyspnoea may add to the discomforts of the patient and in quite the later stages may necessitate tracheotomy.

Diagnosis.—The early recognition of cancer, wherever situated, is extremely important, but especially so in intrinsic cases, for,

as already pointed out, they grow slowly and do not infect the lymphatics, and are therefore very favourable for operative treatment. Unfortunately, as already seen, the symptoms at first are not very definite, and so are apt to be neglected, but speaking broadly, if every patient suffering from persistent and increasing hoarseness were to submit themselves to examination by a laryngologist, much suffering and loss of life would be avoided. "Every patient" is said advisedly, for there is a common opinion that if the patient is under the age of fifty or thereabouts, there is little likelihood of malignancy. This is not the case with regard to the larynx, as malignant growths may occur in young men under thirty, and occasionally in women. In extrinsic cases early diagnosis and operative treatment offers the only possible chance of saving life, but the prospects are not so good as in intrinsic cases, as the lymphatics become infected early, and the disease spreads rapidly.

Intrinsic growths may sometimes have to be differentiated from simple neoplasms and chronic laryngitis, but more often from tubercle and syphilis. In extrinsic cases the diagnosis generally rests between malignancy, syphilis, and tubercle.

As a rule these various affections can be recognised by careful observation of the pathological changes which present themselves, and which have been fully described in other chapters; but, in a certain residue of cases the diagnosis is extremely difficult. In some of them the results of treatment, and in others the microscopical examination of a portion of the growth, must determine the nature of the disease.

In any doubtful case iodide of potassium should be administered in twenty or thirty grain doses three times a day, and its effect carefully watched. If there is no beneficial result, but, on the contrary, the condition is made worse, it is very probably tuberculosis; if there is marked improvement at the end of a week or ten days the case is nearly sure to be syphilitic; whilst if the condition remains stationary or if there is only temporary improvement, the chances are in favour of malignancy. To avoid error, however, it must be remembered that, on rare occasions, malignant disease may be grafted on syphilis, in which case the improvement may be very distinct under iodide of potassium and yet a malignant growth may be present. Whilst the iodide is being administered the sputum should be examined on two or three occasions for tubercle bacilli. If in spite of these diagnostic methods the nature of the growth remains doubtful, a portion

of it should be removed and submitted to microscopical examination, always supposing that the case is suitable for operation and that the patient is fully prepared to undergo it, should the disease prove to be malignant. If, on the contrary, the disease has passed beyond the possibility of complete removal, or if the patient refuse the chance offered by operation, the growth should not be touched, for rapid increase is common after partial removal. To remove a portion of the growth the larynx must be anæsthetised (p. 65), and either Mackenzie's cutting forceps or Watson Williams' punch forceps should be used. In order that a sound opinion may be given on the microscopic section, it is necessary to remove a fair-sized piece, and to make sure of obtaining some of the deeper parts of the tumour. Through failure in this point cases are on record where a correct diagnosis has not been made even by the microscope, and malignant tumours have been left alone until too late. It is often very difficult to remove a piece suitable for microscopic purposes, in which case the clinical signs and symptoms must be relied on for the diagnosis, and for guidance in treatment.

Prognosis.—Malignant growths of the larynx invariably cause death if not removed. Intrinsic cases run a slower course than extrinsic, but even they usually end fatally within two years, though sometimes life may be prolonged to three or four years. Death may result from asthenia, dyspnoea, starvation, lung disease, or pyæmia.

The prognosis, especially in intrinsic cases, is greatly improved by early surgical interference. In intrinsic cases permanent cures often result, and though in extrinsic cases cures are not so common, life may generally be prolonged and rendered more comfortable.

Treatment.—Intrinsic Growths.—As accurate a diagnosis as possible having been arrived at by the means already detailed, the line of treatment to be followed must be determined and undertaken without any delay whatever. Too much stress cannot be laid upon the importance of not wasting time in cases of laryngeal cancer, as the success of treatment and the after-condition of the patient depend upon operating whilst the growth is still small and localised. If removal of the disease is decided upon, thyrotomy, partial excision of the larynx, and total extirpation are the measures at the surgeon's disposal, and the choice as to which of these is to be adopted will depend upon the extent of the growth. As it is generally impossible to determine this by laryngoscopic examina-

tion, it is necessary before commencing any operation to obtain the patient's full consent to the complete operation, should it prove necessary. Total extirpation is a very serious operation, and the after condition of the patient is not altogether enviable. The patient should therefore be left to decide the question for himself after learning the points for and against it. In favour of it he should be told that it is the only possible chance of saving his life, and that without it his death will be comparatively slow and distressing. Against it he must be given to understand that the immediate risk to life is grave, that no absolute guarantee can be given against a recurrence, and that, if he survives, his condition will not be free from certain discomforts, such as the permanent tracheal opening, and the total loss of the natural voice.

Thyrotomy.—This is indicated when the disease is strictly localised and confined to the vocal cords. The larynx is opened in the manner already described (p. 82), and then the haemorrhage is arrested by the application of a solution of supra-renal extract, so that the exact limitations of the growth may be defined. An incision is next made round the growth, including a full half inch of the surrounding healthy structures. This should be done, as Butlin points out, without respect to the after-condition of the voice or any other consideration whatever, except the complete removal of the disease. The parts included within this incision are then dissected off the underlying cartilage and removed, and the cartilage itself is thoroughly curetted with a sharp Volkmann's spoon. The haemorrhage is again arrested by packing the larynx with gauze for a minute or two, and pure nitric acid or the actual cautery is then applied to the curetted surface. Finally the wound is covered with iodoform applied with an insufflator, and the edges of the divided thyroid cartilage are brought together with two or three sutures. The final steps of the operation and the after-treatment, which is very important, have already been described (p. 83).

Partial Laryngectomy.—When the disease, though still unilateral, is more wide-spread and extensively involves the cartilages, a partial excision of the larynx must be undertaken. The amount to be removed will vary according to circumstances from a wing of the thyroid to the entire half of the larynx. Thyrotomy is first performed and the interior of the larynx is examined, and upon the results of this examination the further steps of the operation will depend, but in all cases the removal of the growth must be very thorough. Partial laryngectomy is a dangerous operation, as the

risks of septic pneumonia from blood entering the lungs at the time of operation and from food and discharges running downwards after the operation, are very serious, and septic infection of the wound is not uncommon.

Complete Laryngectomy.—When the disease is bilateral and extensive, total extirpation is the only course, and it is often to be preferred when the disease, though unilateral, is sufficiently extensive to necessitate the removal of the entire half of the larynx, on account of the dangers alluded to above.

There are two methods of performing this operation. In the one the wound is left open and packed with gauze, and in the other the wound is closed and communication between the pharynx and trachea is shut off. The former method is attended by all the dangers of a partial laryngectomy and is a very fatal operation, whilst the latter is comparatively safe because the chances of septic infection of the wound and of the lungs are greatly reduced. This operation was first introduced by Solis Cohen, and is thus carried out :—

1. A vertical incision is made in the middle line of the neck from the upper border of the hyoid bone to about an inch above the sternum. Two transverse incisions are made at either end of the vertical one from sterno-mastoid to sterno-mastoid.

2. By dividing the muscles as close as possible to the cartilages, the soft structures are dissected off the front and sides of the larynx, and are turned outwards until the pharynx and oesophagus can be defined.

3. The trachea is pulled forward and carefully separated from the oesophagus and then completely divided by cutting it across obliquely from before upwards and backwards.

4. The divided end of the trachea is brought forward into the lower part of the wound and secured there by strong cat-gut sutures, and a Hahn's tube is introduced, through which the anæsthetic is administered during the remainder of the operation.

5. The larynx is separated from the oesophagus and pharynx with a blunt dissector from below upwards as far as the arytenoids.

6. The pharynx is opened by an incision through the thyro-hyoid membrane, and the larynx is separated from the pharynx by cutting through the mucous membrane with scissors as near to the diseased area as compatible with safety. In some cases it is possible to leave the whole or a portion of the arytenoids, which is a great advantage. In others not only the arytenoids, but the

epiglottis and a portion of the aryteno-epiglottidean folds must be removed.

7. The pharynx is shut off from the wound by the insertion of several layers of sutures in the following manner:—(a) The opening in the mucous membrane of the pharynx is first united by a vertical row of sutures placed close together. (b) The pharyngeal aponeurosis is next united in a similar manner. (c) The deeper muscles on either side are sewn together across the middle line. (d) The sterno-hyoid and sterno-thyroid muscles of the one side are stitched to those of the other. (e) After inserting drainage tubes into the outer angles of the upper transverse incision and directing them towards the pharynx, the skin and subcutaneous tissues are united along the whole length of the incisions, the trachea being left sutured to the lower part of the wound.

8. The Hahn's tube is removed, and a Durham's tube is inserted into the trachea.

9. The wound is dressed with gauze, and firmly bandaged so as to keep the divided structures in close contact.

Contra-Indications.—External operations for intrinsic growths are contra-indicated in the very old and the very feeble, and in those suffering from severe bronchitis and emphysema, or renal mischief. Thyrotomy is a comparatively mild operation, and may be often undertaken when partial or complete extirpation would be out of the question. If intrinsic cancer has spread to the extrinsic parts of the larynx, if there is extensive secondary involvement of the glands, and especially if the growth has encroached upon the pharynx, no operation should as a rule be undertaken. The treatment becomes palliative and constitutional, as for inoperable extrinsic cancer.

Results of Operation.—Thyrotomy in well-selected cases offers a very good prospect of permanent cure, and is not attended with any grave risk to life. Butlin and Semon have performed this operation in a large series of cases with a very low rate of mortality and a high percentage of cures. As regards partial excision of the cartilaginous structures the prospect becomes more grave according to the amount of cartilage which it is necessary to remove; and, as already pointed out, death from infection of the lungs is very common when anything like half the larynx has to be taken away. In persons of sound constitution total extirpation also holds out fair prospects of permanent cure, provided that the growth at the time of operation is purely intrinsic, and that there is no infection of

the glands. Recently Gluck has shown that even more widespread disease can sometimes be eradicated successfully by very extensive operations (see below).

The results as regards the voice differ according to the operation performed. In simple thyrotomy with the removal of one cord, the voice is usually comparatively good, the removed cord being replaced by a cicatricial band, to which the sound cord, moving across the middle line, approximates. Even if a small portion of the opposite cord has also to be removed a very tolerable voice is usually retained. In partial resection the resulting voice varies with the amount of cartilage removed. There is usually sufficient for the patient to make himself audible, and occasionally the quality of the voice is quite passable. In total extirpation of the larynx, when performed according to Solis Cohen's method, there must necessarily be complete loss of voice.

Extrinsic Growths.—The treatment of extrinsic growths is operative or palliative according to the position and extent of the disease. If the surgeon feels confident that he can remove the whole of the growth without leaving the patient in too hopeless a state of discomfort, subhyoid pharyngotomy, lateral pharyngotomy, partial laryngectomy, or total extirpation of the larynx may be undertaken according to the position of the growth. Growths of the epiglottis and aryteno-epiglottidean folds alone or spreading from the pharynx have been alluded to under malignant disease of the pharynx, and the feasibility of their removal discussed (pp. 467 to 471). Gluck, however, has recently stated that more extensive growths can in some instances be successfully removed by means of complete laryngectomy combined with pharyngectomy. In these extensive operations the after-condition of the patient must be taken into consideration and fully explained to him. An artificial pharynx may be necessary as well as an artificial larynx, both of which are sources of much discomfort and worry. The most hopeful cases, of course, are those in which the disease is seen in the very early stages, and in many of them operative measures should certainly be undertaken, but if the disease is extensive, involving the pharynx as well as the larynx, it almost seems more merciful to adopt palliative measures only. In view, however, of the successful cases reported by Gluck the position should be explained to the patient and the question left to him to decide.

In extrinsic cancer the glands of the neck are always infected,

and whatever operation be decided upon a complete dissection of the triangles of the neck must be made, and all glands, lymph vessels, and connective tissue removed. As a rule the infected glands are found to be far more numerous than had been expected from palpation.

In very old and feeble patients, or when other organs are diseased, such operations cannot be expected to be followed by good results, and should not be suggested. Occasionally the glands are so extensively diseased, matted together, hard, and immovable, that their removal is impossible, in which case no operation should be undertaken for the excision of the primary growth.

Results.—The chances of permanent cure are not so good as in intrinsic cases, and the immediate risk to life is greater, but if the case is operated on in its early stages there are very considerable prospects of greatly prolonging the patient's life, and in some cases of obtaining a cure. In a series of twenty-two cases of complete laryngectomy, Gluck had only one death, and that was from iodoform poisoning in a man aged seventy ; and out of twenty-seven cases of partial extirpations of larynx and pharynx he had only one death, and that was from hemiplegia after tying the carotid. He stated at the time of making his report (July 1903) that he could show thirty-eight living patients who had been cured by these operations. The oldest case had been operated on thirteen years ago. Others had died from three and a half to eleven years after operation, often from other causes.

Palliative Treatment.—If it is decided that operation is unadvisable owing to the patient's general condition or to the extent of the growth, palliative measures may do something to render his existence more tolerable. They consist in keeping the larynx clean and sweet, in relieving pain, and in preventing death from suffocation or starvation. Cleansing is effected by washing the larynx two or three times a day with alkaline lotion or Condy's fluid by means of a spray, and the foetor is counteracted by insufflating iodoform or iodol. Pain is relieved by insufflations of orthoform, the effect of which often lasts many hours. If orthoform gives no relief, a morphia insufflation (p. 43), or a little 5 per cent. solution of cocaine, may be applied, but their effects are only of short duration. If local applications are unavailing the patient should be kept as far as possible free from pain by the internal or hypodermic administration of morphine. For the relief of dyspnoea, tracheotomy should be performed, without too long delay. It often not only

relieves the difficulty of breathing, but for a time seems to improve the patient generally, and there are many cases on record where this operation has apparently greatly added to the length of life. Difficulty of swallowing is sure to require treatment sooner or later. In the early stages much may be done by selecting suitable food, which as a rule should be semi-solid and unirritating, on the lines suggested for the dysphagia of tuberculosis (p. 124). The local applications for the relief of pain will also render deglutition less painful, and drinking with the face downwards may also help. In extreme cases rectal feeding, tube feeding, or gastrostomy may be indicated. If the primary seat of the growth is on the epiglottis the dysphagia may sometimes be relieved, and the patient's general condition improved, by its removal. This in some cases can be effected at one sitting by means of large punch-forceps (Fig. 78, p. 121). Tilley has recently reported a case in which the patient derived great comfort and benefit from this proceeding.

Other Methods of Radical Treatment.—Various intra-laryngeal methods of removing or destroying malignant growths of the larynx have been suggested and carried out, of which the following require notice:—

(1) *Application of Chemical Caustics* such as solid nitrate of silver. This can only act as an irritant and lead to an increase in the activity of the disease, and is now, therefore, universally condemned.

(2) *The Electric Cautery.*—Much the same may be said of this as of the former method, though there are a few who think it useful in very early cases.

(3) *Electrolysis.*—This has been recommended in early cases, if the patient absolutely refuses an external operation. The process is very slow, tedious, and painful, and it is very doubtful whether it is ever possible to destroy the whole disease, recurrence of which must consequently be expected.

(4) *Removal through the Mouth.*—This has been attempted by means of snares or cutting instruments. In cancer of the larynx, as in cancer elsewhere, no operation whatever should be undertaken as a curative measure unless there is a certainty of being able to remove the whole of the diseased area with a portion of healthy tissue all round its attachment. This it is obviously impossible to do with a snare, so that the method must be unhesitatingly condemned. There are, however, some authorities, notably B. Fraenkel and Juracz, who consider it not only

possible, but even advisable to remove very limited malignant growths by means of intra-laryngeal cutting instruments. The operator must feel absolute confidence in being able to get the whole of the diseased area away, for if only portions of it are removed, a very rapid extension of the growth is almost certain to follow. The question, therefore, arises whether such confidence is ever justified. Considering that the essential characteristic of malignant growths is to infiltrate the deeper structures, and the fact that in nearly every case the growth is more extensive than the laryngoscopic appearances indicate, it is evidently impossible to define the limitations of the tumour, and therefore there can be no certainty of removing all the disease. Further, the very cases where intra-laryngeal methods are recommended, are those in which such excellent and lasting results can be claimed for thyrotomy ; so that there can be no doubt that this method is the more precise, thorough and surgical, and, therefore, very much the better.

CHAPTER XXVI

INJURIES. FOREIGN BODIES. CONGENITAL DEFORMITIES

I. INJURIES: A. *Cut Throat*.—B. *Fractures*. II. FOREIGN BODIES: A. *In the Laryngo-Pharynx*.—B. *In the Larynx*.—C. *In the Trachea*. III. CONGENITAL DEFORMITIES: *Webs*—*Laryngeal Stridor*.

I. INJURIES OF LARYNX

OF the various injuries which may occur, the following may come under the observation of the laryngologist either at the time of the accident or later:—cut throat, fractures of the hyoid bone, and fractures of the laryngeal cartilages.

Cut Throat.—This is the result of suicidal or homicidal intentions, and varies in degree from a mere skin incision to the division of great vessels and nerves of the neck, with or without the opening of the air passages. It is only when the air passages are opened that the laryngologist is likely to be consulted, and then, as a rule, only in the later stages should aphonia or dyspnoea develop.

The air passages may be opened in the following situations: (1) above the hyoid bone; (2) in the thyro-hyoid space (commonly); (3) through the thyroid cartilage (rarely); (4) in the crico-thyroid space; (5) through the trachea.

The complications which may follow such injuries are, (1) septic cellulitis, which may spread to the mediastinum; (2) pneumonia and broncho-pneumonia; (3) surgical emphysema; and (4) septic traumatic fever.

The sequelæ met with are, (1) aerial fistula; (2) laryngeal or tracheal stenosis, due to cicatricial contractions and adhesions; and (3) aphonia from the same causes or from division of the recurrent laryngeal nerves at the time of the injury.

For the treatment of cut throat, text-books on general surgery must be consulted. If the patient survive and dyspnoea results, attempts must be made to dilate the contracted passages. This is carried out on precisely similar lines to those for stenosis

following syphilis, which has already been fully discussed (p. 164). The aphonia, if due to contractions, may be improved by treating the stenosis; but if it is due to division of the recurrent laryngeal nerve nothing can be done.

Fractures.—Fractures of the hyoid bone and of the laryngeal cartilages may occur. Both are generally due to hanging or throttling, though occasionally they result from blows.

(1) **Of the Hyoid Bone.**—The fracture may occur through the body, but more often at the junction of one or other of the cornua with the body. The immediate *symptoms* are severe pain and difficulty of swallowing and speaking, and, if the fractured ends have perforated the mucous membrane, as generally happens, there will be haemorrhage from the mouth, and occasionally dyspnoea. Within twenty-four or thirty-six hours inflammation is liable to occur accompanied by rapid and considerable oedema, which may lead to severe dyspnoea.

Treatment.—Reduction of the fracture and relief of dyspnoea are the two chief indications for treatment.

Reduction of the Fracture may be accomplished either by manipulation or by external operation with wiring of the fractured ends. Reduction by manipulation is quite easy, but it is almost impossible to keep the ends in apposition. External operation and wiring give quicker and better results, and diminish the risk of oedema and dyspnoea, especially in compound cases.

Methods.—Reduction by manipulation is carried out by introducing the forefinger of the left hand into the pharynx whilst the right hand manipulates the fragments from the neck. This can generally be done under cocaine anaesthesia, though general anaesthesia may sometimes be necessary. Some softened poro-plastic must be at hand, and directly the fragments are in apposition the neck must be fixed by a collar-like splint so as to prevent flexion or lateral movements. To assist further in keeping the parts quiet, talking is prohibited, and the patient is fed by the rectum for the first few days if possible.

Reduction by operation is a comparatively easy procedure; "the bone can be readily exposed by a transverse incision over the seat of fracture, care being taken in deepening the incision not to go too far back or too low down, which would endanger the superior laryngeal nerves. The bone is then wired in the ordinary manner" (Cheyne and Burghard).

Relief of Dyspnoea.—Dyspnoea may occur at the time of the

fracture from haemorrhage, or from one to three days after the accident from acute inflammatory oedema. The haemorrhage is seldom sufficiently severe to cause any serious difficulty of breathing, but occasionally it may be necessary to perform a hurried laryngotomy. When severe dyspnoea results from oedema, it must be treated on the same lines as acute oedematous laryngitis (p. 497). As a rule, surgical interference will be necessary.

(2) **Fractures of the Laryngeal Cartilages.**—This is a rare accident, but usually a very serious one. Death may occur at the time of the accident from asphyxiation due to displacement of the cartilages; or, later, from dyspnoea due to oedema.

Treatment.—If there is severe dyspnoea laryngotomy should be performed without delay (p. 75); and directly the patient is breathing comfortably the incision should be carried upwards in the middle line and the thyroid cartilage exposed. The fracture should then be located, and the displaced portions of the cartilage brought into position, and secured by a few cat-gut sutures. The upper part of the skin incision is united, but the laryngotomy tube must be left in until the oedema has subsided. If there be no dyspnoea and no displacement of the fractured portion of cartilage, operative measures need not be immediately undertaken. Rest to the injured parts is secured by moulding a poroplastic splint to the neck so as to prevent rotation or flexion, and the case must then be watched. Inflammatory oedema may, however, occur at any time and increase rapidly, when intubation or tracheotomy (pp. 77 to 82) will become necessary and should not be delayed. If much displacement of the cartilages can be made out by palpation or laryngoscopic examination, the fractured portions should be exposed and sutured as recommended above.

II. FOREIGN BODIES

Small foreign bodies in the oro-pharynx are discussed elsewhere (p. 479), but large foreign bodies impacted in the laryngo-pharynx causing obstruction to breathing are included here. As the treatment varies to some extent with the position of the foreign body this subject will be divided into foreign bodies in (1) the laryngo-pharynx, (2) the larynx, (3) the trachea and bronchi.

1. **In the Laryngo-Pharynx.**—Foreign bodies must be of considerable size to become impacted in this region and cause

urgent symptoms. They are generally either a tooth plate or a bolus of food. Food may become lodged in this situation either during vomiting or through carelessness in swallowing, whilst artificial teeth more often find their way there during sleep.

The symptoms are those of sudden asphyxiation, and are of such extreme urgency that death may result before help can be obtained.

Treatment.—The mouth should be opened by means of a gag, if at hand, or levered open with the handle of a spoon, tooth brush, or anything which comes quickest to hand; then a finger should be passed down the pharynx and the region explored. If a bolus of food is felt an attempt should be made to hook it up with the finger, or to push it into the oesophagus. If it cannot be dislodged in either way, laryngotomy should be performed without further delay, and artificial respiration resorted to if necessary. If a tooth plate is discovered with the finger, a gentle effort may be made to pull it up, but it often happens that the metal hooks which fit round the teeth have become caught in the mucous membrane, and it is impossible to dislodge it without undue force. Here again laryngotomy should be performed at once and the patient restored by artificial respiration if necessary. A quiet and more deliberate examination of the parts must then be made by means of the laryngoscope. If a bolus of food is there, it may be broken up and either withdrawn or pushed on into the oesophagus; if a tooth-plate, it must be engaged in the blades of curved forceps, and a gentle effort made to withdraw it. Careful manipulation is generally necessary to disengage the metal hooks from the mucous membrane. When the foreign body has been successfully removed, the laryngotomy tube is taken out and the wound dressed, but not sutured for fear of surgical emphysema.

2. **In the Larynx.**—Almost any small body may enter the larynx and become impacted there. The foolish habit of holding such things as pins or tin-tacks in the mouth whilst at work is a common source of foreign bodies in the larynx, or a sudden inspiration during swallowing may be the cause (Fig. 253). Foreign bodies may also reach the larynx during sleep or during vomiting, especially if the person is drunk or anaesthetised.

The Symptoms depend somewhat on the size of the foreign body. If large there will be sudden and urgent dyspnoea, and

possibly asphyxiation necessitating immediate tracheotomy, if life is to be saved. Small bodies cause sudden pain, cough or choking, and alteration or loss of voice. As a rule, the entrance of a foreign body into the larynx is marked by a severe spasm of the vocal cords, sometimes ending fatally, though as a rule passing off after a minute or two, leaving the patient so comfortable that it might be thought that the foreign body had been coughed up. If the foreign body is loose the spasm soon recurs, but if it become impacted there is usually no recurrence, though there is always a chance that it may become dislodged and set up



FIG. 253.—Fragment of bone impacted in the ventricles of the larynx: A, as seen on examination with the laryngoscope; B, as pieced together after removal by Sir Morell MacKenzie. In both figures *a* represents the portion of bone visible, and in B, *r* is the portion of bone concealed in the right ventricle, *l* that concealed in the left ventricle, and *e* the portion hidden by the epiglottis.

fresh attacks. If the object is smooth and rounded and especially if lodged in a ventricle no further symptoms of any sort may arise for a very long period, but if sharp or jagged there will be continued pain and cough, and, if the mucous membrane be torn, free expectoration of blood. After a few days inflammatory symptoms will commence. There may be acute oedema, perichondritis, or the formation of an abscess, any of which, but especially oedema, may be accompanied by rapidly progressing dyspnoea, necessitating surgical interference. Slow ulceration round the foreign body may also occur, but is not likely to cause dyspnoea.

The Diagnosis is based on the history, which often clearly points to the probability of a foreign body in the air passages, and on the symptoms. In some cases it may be possible to arrive at a definite diagnosis by means of a laryngoscopic examination, and if foreign bodies are impacted and hidden by surrounding swelling and oedema, much help may often be gained by radiography.

Treatment.—Removal should always be promptly undertaken however quiescent the symptoms may be. Though cases are on record where no serious symptoms have developed for many

years, yet there is always the possibility of complications which may endanger life. The method of removal will vary according to the nature and exact position of the foreign body, and with the urgency of the symptoms. In many cases the dyspnoea will be so serious as to necessitate an immediate tracheotomy, which should be performed without delay (p. 77). When this has been done, or when the necessity for it does not arise, the larynx should be carefully examined with the laryngoscope and the nature and position of the foreign body determined. If it can be seen and is within reach the larynx must be cocaineised (p. 65), and the removal attempted with forceps. A forceps must be selected according to the nature and position of the foreign body. Mackenzie's are useful for rounded bodies and Watson Williams' for flat bodies such as coins. For suggestions for introducing the forceps, see p. 67. If this method is unsuccessful and the foreign body is lying loose in the larynx, the patient should be inverted and slapped sharply on the back, and, if this does not dislodge it, he should be instructed to take a deep inspiration very slowly and gently and to follow it with forcible expiratory efforts.

If it is found impossible to remove it by these means, thyrotomy must be undertaken. This operation has already been described (p. 82), but when performing it for removal of a foreign body the thyroid cartilage should not be completely divided in the first instance, a third of an inch of its upper part being left intact. The cartilages are then firmly retracted and the position and character of the foreign body determined. If small and smooth its removal may be proceeded with by pushing it upwards into the pharynx and removing it through the mouth. If the foreign body is jagged or large, the remaining portion of the thyroid cartilage and part of the thyro-hyoid membrane must be divided, as it is very important to avoid injuring the vocal cords. It must be very carefully disentangled from the surrounding mucous membrane and removed through the thyrotomy wound. When it is extracted the edges of the cartilages must be accurately adjusted and united with sutures, and the incision through the overlying soft structures sewn up. As considerable oedema of laryngeal mucous membrane may supervene, a tracheotomy tube must be kept in the trachea for three or four days.

3. In the Trachea or Bronchi.—Small foreign bodies may

pass through the glottis and enter the trachea or bronchi. They may remain loose in the trachea, but more often they become impacted in one of the bronchi, most usually the right, as it is larger and in a more direct line with the trachea.

Symptoms and Complications.—If the object be loose in the trachea, there will be recurrent attacks of laryngeal spasm, due to its occasional impact against the cords. If it becomes fixed in one of the bronchi, the corresponding lung will become partially or completely collapsed. Unless it is removed inflammation will occur around it, when it may become free once more and be coughed up into the trachea, causing renewed attacks of laryngeal spasm. The inflammation round the foreign body may spread to the collapsed lung and cause pneumonia, or an abscess may form, which may burst into the trachea, into the pleura, or into the mediastinum.

Diagnosis.—The history and symptoms will generally render the diagnosis clear. It can often be confirmed, and the exact position of the foreign body ascertained, by means of the X-rays.

Treatment.—Removal should always be attempted, whatever the symptoms, for, as seen above, very grave complications may occur at any time. The method will depend on whether the foreign body is free in the trachea, or impacted in a bronchus. If in the trachea the simple plan of inverting the patient and shaking him, or hitting his back, may be tried, though it is as well to have everything prepared for tracheotomy in case the body should become impacted in the larynx or cause dangerous spasm of the cords. If this is not successful tracheotomy should be performed (p. 77). The trachea is well exposed and an opening made sufficiently big to allow of the exit of the body. The opening being fully dilated by means of the hooks or retractors, the coughing, which usually ensues on opening the trachea, may expel the body at once, or at any rate bring it into view, when it can be seized with forceps and extracted. If it does not appear, inversion and shaking may be tried, or more coughing may be incited by tickling the back of the trachea with a feather. If all these methods are unsuccessful at the moment, a self-retaining retractor should be inserted into the trachea, and the patient put back to bed. Generally before long the foreign body will be coughed out through the wound.

If it is impacted in a bronchus a low tracheotomy should be done, and the tracheal opening widely dilated. The exact

position of the body is then located by means of a probe, and an attempt is made to remove it with a long pair of fine forceps, or with a long probe, the end of which is bent like a strabismus hook. In some cases great advantage may be gained by extending the tracheal wound as low as possible, and this should be tried before relinquishing the attempt at removal. If all efforts prove useless, a large tracheotomy tube should be inserted and the incision sutured above and below it. Inflammatory action may loosen the foreign body and it may be subsequently coughed out. If this does not occur, it may be possible to locate the foreign body by means of X-rays, and with the help of the shadow on the fluorescent screen to pass forceps through the tracheal opening and to guide them on to the foreign body and thus remove it. Operations have been recommended for removing the foreign body through the chest wall, either by resecting parts of the sternum in front, or portions of the ribs behind, but the results are far from encouraging.

Other Methods.—*Upper Tracheoscopy and Upper Bronchoscopy.*

—These methods are strongly supported by Killian, and depend upon the fact that it is possible to pass a straight tube through the larynx into the trachea and even into the bronchi without causing damage to the parts. Killian says that as a rule local anaesthesia is quite sufficient, though in children and nervous adults a general anaesthetic is advisable. The tube is illuminated by Kirstein's forehead lamp and guided along the air passages by direct vision. The larynx, the trachea, and the right and left bronchi are thus searched until the foreign body is found. When it is located, a fine forceps or a hook is passed through the tube and the foreign body is engaged and withdrawn through the tube, or, if too big, with the tube.

Lower Tracheoscopy and Bronchoscopy.—These methods are the same in principle as the above, only they are employed through the tracheal opening in cases where it has been necessary to do tracheotomy.

Killian may be quoted as to the results of these methods. Out of 20 cases of bronchoscopy (half of which were in children), 11 cases were of the upper and 9 of the lower method. In 9 of the 11 upper bronchoscopies a certain diagnosis was arrived at, and of the 9 lower bronchoscopies in 7 cases a foreign body was discovered, whilst in 2 it was shown that no foreign body was present. Out of these 20 cases extraction

was attempted in 15 and succeeded 8 times with upper and 5 times with lower bronchoscopy.

Extraction by the Electro-Magnet.—Metallic foreign bodies have been extracted by this method. Dr. Macintyre has devised a suitable apparatus, and advises that the method should have a further trial.

III. CONGENITAL DEFORMITIES

Webs.—**Definition.**—The existence of a membrane of congenital origin between the anterior portions of the vocal cords.

Laryngoscopic Appearances.—A congenital web varies from a mere fold of mucous membrane between the cords in the



FIG. 254.—A congenital web.

anterior commissure to a distinct membrane uniting the cords for as much as half their length and causing respiratory obstruction. The web is covered with mucous membrane, and is generally quite symmetrical in shape, the free margin behind being usually concave (Fig. 254). It may be quite thin or of considerable thickness. Occasionally a web is found uniting the ventricular bands either alone or together with a web between the cords. Accompanying congenital webs there are no signs whatever of any scars or adhesions indicating former disease. (Compare Fig. 254 with Fig. 92, p. 153.)

Symptoms.—In slight cases there may be no symptoms whatever. In extensive cases alteration of the voice and more or less permanent difficulty of breathing, combined with attacks of severe dyspnoea, are the usual symptoms.

Diagnosis.—Congenital webs have to be distinguished from those due to past disease or traumatic inflammation. The latter are chiefly connected with syphilis or cut throat, and evidences of the original trouble can nearly always be traced in the shape of scars, adhesions, or inflammatory thickening.

Treatment.—The majority of these cases require no treatment at all. It is only when there is dyspnoea or serious loss of voice that they should be interfered with. They must then be removed either by intra-laryngeal operations or by thyrotomy.

Intra-laryngeal operations may be attempted if the membrane is thin, whereas thyrotomy is indicated when the membrane is thought to be thick, or when intra-laryngeal methods have failed. The intra-laryngeal methods which may be adopted are removal, simple division, and dilatation. Removal is recommended by Schroetter, and is thus carried out: A small hole is made quite at the anterior part of the membrane with a knife or cautery point, and dilated with a probe. A knife is then introduced into the hole and carried backwards along the edge of the cord until it almost reaches the posterior margin of the web. A similar incision is then made along the other cord, and finally the tissue, which is then almost severed, is removed with a pair of forceps. Simple division is carried out by means of a laryngeal knife, the incision being made in the middle line. Dilatation is done by means of cutting dilators, of which Whistler's is a useful form, but the method is more applicable to cicatricial adhesions than to congenital webs.

When *thyrotomy* is undertaken the larynx is opened in the usual way (p. 82), and the web carefully dissected away from its attachment to the cords and removed.

After-treatment.—Whether the web is removed or simply divided great care will be necessary to prevent the occurrence of adhesions between the wounded surfaces. The case must be seen daily and any growing adhesions broken down with a probe or by the passage of a bougie.

Congenital Laryngeal Stridor.—*Definition.*—A peculiar noisy respiration occurring in infants resulting from a malformation of the upper aperture of the larynx, which is either congenital in origin (Sutherland and Lack) or acquired shortly after birth and due to "ill co-ordinated stammering breathing" (Thomson and Logan Turner).

Laryngoscopic Appearances.—The epiglottis is folded on itself from above downwards, and the two lateral folds are in close apposition and sometimes in contact. The aryteno-epiglottidean folds are also approximated towards the middle line, and thus the upper aperture of the larynx is reduced to a long narrow slit. The folds bounding this aperture are thin and flaccid, and flap to and fro on respiration. On inspiration they are driven together and on expiration they are separated. In some cases coarse vibrations of those folds can be distinctly seen, whilst a purring noise is produced.

Symptoms.—The chief symptom is the noisy respiration. Inspiration may commence with a croaking sound and end in a high-pitched note, whilst expiration may be accompanied by a short croak or may be noiseless. Or again, the inspiratory stridor may take the form of a deep purring or growling note, or a high-pitched clear or squeaking note, whilst the expiratory sound is sometimes nasal or pharyngeal in character. These noises are greatly increased when the infant coughs, cries, or becomes excited. Of other symptoms may be mentioned recession of the soft parts below the seat of obstruction and consequent deformities of the chest, some cyanosis in bad cases, and a tendency to bronchitis and other lung troubles.

Diagnosis.—The history of the case and the laryngoscopic appearances generally determine the diagnosis. Papillomata and the various forms of glottic spasm in infants and acute laryngitis are the troubles with which it is most easily confounded.

Prognosis.—As a rule the symptoms disappear by the end of the second year and often before, but the deformity on which they depend may persist very much longer. Death may occur from bronchitis or pneumonia, and the presence of congenital stridor seriously affects the prognosis of any acute illness.

Treatment.—Nothing can be done to relieve the underlying malformation, so the treatment must consist in the relief of symptoms and in the general management of the infant until the deformity ceases to cause obstruction. Occasionally the dyspnoea may be sufficiently severe to necessitate tracheotomy, and if so, the operation should not be postponed too long. Especial care must be taken to prevent acute catarrhs, which might increase the dyspnoea, and to keep the child in thoroughly good general health. If he gets debilitated or rickety, the flaccidity of the structures forming the upper aperture of the larynx will increase and with it the dyspnoea. On the other hand, the healthier the general development of the child, the sooner will the flaccidity disappear.

APPENDIX

NOTIFICATION AND ISOLATION OF FIBRINOUS RHINITIS

IN the text (p. 205) notification and isolation of fibrinous rhinitis were advised as the safer plan, chiefly because of the danger of sending a child suffering from true nasal diphtheria into a crowded class-room, owing to an error of diagnosis. If, however, the history, the course, and the symptoms of the case leave no doubt that the patient is suffering from fibrinous rhinitis and not from nasal diphtheria, it is a question worthy of debate whether the child should be sent to an isolation hospital and so be exposed to true diphtheria. To arrive at a conclusion the following points must be considered :—

1. The absolute identity of the bacilli found in fibrinous rhinitis and in diphtheria.
2. Whether membranous rhinitis ever gives rise to diphtheria in others.
3. The distribution of Klebs-Loeffler bacilli (1) amongst the healthy and (2) in other diseases.
4. Whether it is right to isolate every individual, healthy or unhealthy, in whom Klebs-Loeffler bacilli can be found.

1. As regards the absolute identity of the bacilli found in these two diseases, it may be said from Lack's and Meyer's investigations that morphologically they are identical, that their method of growth on various culture media is identical, that the bacilli found in fibrinous rhinitis are virulent and capable of producing virulent toxins, and that these toxins, as well as the living bacilli, are neutralised by diphtheria anti-toxins. These facts place the identity of the two bacilli beyond doubt, and it is thus seen that identically the same bacillus may produce two diseases markedly different clinically. A parallel to this is found in the tubercle bacillus, which may produce on the one hand acute tuberculosis,

which as a rule quickly ends fatally, and on the other hand lupus, which is very chronic and never directly causes a fatal termination.

2. The next point, namely, whether fibrinous rhinitis is ever contracted from diphtheria or causes diphtheria in others, is the most important, for, if it can be shown that fibrinous rhinitis gives rise to diphtheria, the question is answered, and every case of fibrinous rhinitis must be notified, isolated, and treated in every way as one of diphtheria. Lack went very carefully into this question in his thirty-six cases, and could only find one case in which there was any possibility of diphtheria being the cause of fibrinous rhinitis, and that was extremely doubtful, but noted several cases of fibrinous rhinitis occurring in the same families. He concluded that the disease was infectious with a special tendency to reproduce itself. As regards the possibility of fibrinous rhinitis causing diphtheria in others, most searching investigations were made, and yet it was impossible to find a single instance of such an occurrence. He concludes his remarks on the subject by saying, "Without, therefore, denying its possibility, its occurrence must be admitted to be extremely rare, and at present not authenticated." Other observers, in the main, agree with this conclusion; and in the nine cases investigated at the Throat Hospital, no case occurred where there seemed any possibility of infection from diphtheria, and no case of diphtheria could be traced amongst those with whom the patients had been associated, in spite of the fact that some of them had been attending school and mixing freely with other children for as long as a fortnight before coming under observation. Judging from existing knowledge of this disease, it may therefore be said that fibrinous rhinitis never causes diphtheria in others, and that diphtheria never causes fibrinous rhinitis, but that membranous rhinitis is infectious *as* fibrinous rhinitis, and diphtheria *as* diphtheria. If this is so, the only reason for isolating and notifying fibrinous rhinitis is the presence of the Klebs-Loeffler bacilli in a virulent form.

3. The distribution of this bacillus must be considered first in the healthy, and secondly in those suffering from diseases other than diphtheria. Amongst people in apparently excellent health the Klebs-Loeffler bacillus is often found; thus Lack examined the secretion from the noses of 100 children who were either healthy, or had adenoids or some slight chronic catarrh, and found in 13 per cent. true Klebs-Loeffler bacilli, and in 52 per cent. a bacillus closely resembling it, probably Hoffmann's. Gross made weekly

cultures from the throats of 300 healthy children, and found Klebs-Loeffler bacilli in 8 per cent. of them. Muller also found it in the throats of 27 per cent. of healthy children, and in the nose, Thomas found it in 24 per cent. and Vassant in 27 per cent. Amongst people who were themselves healthy, but had been in contact with diphtheria, Johanesson found Klebs-Loeffler bacilli in from 13 to 15 per cent., Asser in 19 per cent., Maud 41 per cent. Thus it may be concluded that in healthy people who have not been exposed to diphtheria, the Klebs-Loeffler bacilli may be found in from 8 to 27 per cent., and in those who have been exposed to diphtheria in from 13 to 41 per cent.

Secondly, as regards other diseases, Todd has described a condition which he calls external rhinitis, and which is characterised by redness, rawness, and the formation of crusts about the alæ and vestibule of the nose. It occurs chiefly amongst children during convalescence from scarlet fever, is contagious from child to child, but is unaccompanied by any clinical symptom or sequela of diphtheria. In spite of this, in the fifty-one instances observed by Todd, virulent Klebs-Loeffler bacilli were found in every case. In addition to this, a bacillus practically indistinguishable from Klebs-Loeffler has been found (by Cautley) in acute febrile nasal catarrh, in many forms of ulceration of the skin, in stomatitis, cancrum oris, and in noma, and lastly it has been met with in association with foreign bodies in the nose. A non-virulent bacillus resembling Klebs-Loeffler bacillus is also found in impetiginous ulcerations of the skin, and the late Professor Kanthack stated that this could be so altered by continued growth, as to resemble Klebs-Loeffler still more closely, and even to acquire pathogenic properties. In Kanthack's opinion, the diphtheria bacillus is very widely distributed, frequently in modified forms, but still in forms practically indistinguishable from the true Klebs-Loeffler, and he thought the view that the diphtheria bacillus was to be found in many lesions, which were not diphtheria, would gradually gain ground.

4. The last point for consideration is whether it is right to isolate every individual, whether healthy or unhealthy, in whom Klebs-Loeffler bacilli can be found. It is true that in schools epidemics of diphtheria can be stamped out more surely and quickly by isolating all children, even though apparently healthy, in whose throats diphtheria bacilli can be discovered; but apart from this, as far as is known at present, healthy people and people suffering from ailments in no way associated with diphtheria, in whom

these bacilli can be found, are in no way a danger to the public by reason of their presence, and consequently there seems to be no necessity for isolating them. If, therefore, the view that fibrinous rhinitis is clinically an absolutely different disease to nasal diphtheria, and that it never causes diphtheria in others, is correct, there can be no more reason for isolating patients suffering from it, than for isolating the healthy in whom Klebs-Loeffler bacilli are found. If the mere presence of the Klebs-Loeffler bacilli is to be the criterion of notification and isolation, about a fifth of the inhabitants of all large towns, and a less proportion of other districts, would be constantly isolated, which would be both impracticable and absurd. Therefore it may be held that it is not necessary to notify and to rigidly isolate fibrinous rhinitis. Seeing, however, that it is infectious as such from child to child, modified isolation should be adopted. The patient should not be allowed to attend school, should sleep by himself, and should not mix with other children, and before letting him run free again, every care should be taken to make sure that the diagnosis was correct; for should the case eventually prove to have been one of diphtheria, untold harm might have been done. If ever there is a history of a previous exposure to infection from diphtheria, it will be safer to look upon the case as one of diphtheria and act accordingly, for, as already pointed out, as far as can be gathered from recorded cases, no instance of true membranous rhinitis could be traced to infection from diphtheria.

INDEX

ABDUCTOR muscles, 537
 bilateral paralysis of, 546-550
 diagnosis, 548
 from bilateral ankylosis of crico-arytenoid joint, 534
 etiology—
 myopathic origin, 547
 neuropathic origin, 546
 simulated by "perverted action" of the cords, 188
 treatment, 548-550
 relief of causal condition, 548
 " dyspnea, 549
 " local paralysis, 549
 unilateral paralysis of, 550, 551
Abscess and haematoma of septum, 346
Abscess, of larynx—
 in acute oedematous laryngitis, 495
 " perichondritis, 500
 " traumatic laryngitis, 508
retro-pharyngeal—
 chronic tuberculous, 138
 treatment, 139
 external operation, 139
 internal operation, 141
traumatic, 436
 treatment, 438
tonsillar, traumatic, 438
tonsillar and peritonsillar, acute inflammatory, 426, 433, 434
Abscission of laryngeal papilloma, 569
Accessory sinuses, nasal—
 acute inflammatory affections of—
 etiology, 253
 causes of inflammation, 253
 " retention of discharge, 253
 " suppuration, 254
 symptoms and course of, 254, 255
 treatment, general and local, 255-259
 (*See also* under Antrum (maxillary) and names of other sinuses)
 anatomy of, 246-250
 chronic suppuration of, 259
 complications, 266, 267
 definition, 259
 diagnosis, 267
 " by transillumination, 267
 " etiology, 259
Accessory sinuses, nasal—
 atrophic rhinitis as cause of, 309
 exploration of sinuses, and treatment, 269-297 (*see also* under names of various sinuses)
 pathological changes, 260
 symptoms, 262
 of particular sinus involved, 264
 " set of sinuses involved, 263
 " sinus suppuration generally, 262
 mucoceles of, and their treatment, 250-253
Acromegaly, changes in the upper respiratory tract in, 179
Adductor muscles, 536
 paralysis of (including functional aphonia), 187, 552
 treatment—
 of functional paralysis—
 general, 553
 local, 554
 " myopathic paralysis, 556
 phonic spasm of, 544
 rhythmic clonic spasm of, 543
Adenoids, 382-405
 as cause of deviations of septum, 324
 clinical results of, 383
 changes in ears, 387
 " face, 384
 " mouth, 384
 " nasal cavities, 384
 " neck, 386
 " pharynx, 385
 " thoracic walls, 387
 detection of, by digital examination, 16
 diagnosis, 391
 etiology, 382
 high arched palate due to, 324
 pathological changes, 382
 prognosis, 391
 recurrence, chances of, 404
 reflex neuroses attributable to, 390
 symptoms, 387-391
 treatment of, 392
 medical measures, 392
 prophylactic measures, 392
 surgical measures, 394
 anesthetic in, 396
 indications for, 394

Adenoids, treatment of—
 surgical measures—
 operations for—
 after-treatment, 401-404
 methods of, 397
 in children under fifteen years, 397
 „, older children and adults, 400
 position of patient for, 397
 results of, 404
 risks of, 395
 acute otitis media, 395
 haemorrhage, 395
 paresis of palate, 396
 pneumonia, 395
 septic poisoning, 395

Adenoma of pharynx, 463

Adhesions of larynx, syphilitic, 153
 treatment of, 164

Adhesions of palate and pharynx, syphilitic, 151
 treatment of, 161

Adhesions of septum to outer wall of nose, 348
 treatment of—
 operative, 348-349
 preventive, after intra-nasal operations, 71

Ale nasi, collapse of, 349
 treatment, 349-351

Alveolar puncture for chronic antral suppuration, 271

Anæmia, condition of upper respiratory tract in, 177
 of larynx, localised, complicating phthisis, 99, 105

Anæsthesia, due to disease—
 of the larynx, 558
 „, nose, 354
 „, pharynx, 475

Anæsthetics, general—
 for examination of larynx in children, 26
 „, operations on nose and throat, 61-62
 „, removal of adenoids, 396
 „, removal of laryngeal papillomata in children, combined with local anæsthesia, 570
 „, tracheotomy, 77

Anæsthetics, local—
 choice of, 62
 methods of application, 63
 in larynx, 65
 „, naso-pharynx, 64
 „, nose, 63
 „, pharynx, 64
 poisoning by, 66
 (*See also* Cocaine, Eucaine, Supra-renal Extract)

Aneurysms, complications arising from, 175

Angina, Ludovici, 419, 494
 „, Vincent's, 427

Angioma—
 of larynx, 573, 574
 „, nasal cavities (bleeding polypus of septum), 369, 370
 „, pharynx, 463
 treatment, 463

Angio-neurotic oedema, affecting the upper respiratory tract, 183

Ankylosis, chronic, of crico-arytenoid joint, true and false, 533-535
 diagnosis from paralysis of cords, 534

Anosmia, 352-353

Antimony, cause of toxic pharyngitis, 439

Antiseptics—
 collunaria, 48
 insufflations, 42, 43
 paints, 40

Antitoxin, diphtheritic, in atrophic rhinitis, 319
 in diphtheria, 94-95
 „, membranous laryngitis, 506

Dunbar's, in hay fever (*see* Pollantin), 361

Marmorek's, in tuberculosis, 112

Streptococci, in septic pharyngitis, 421
 in septic perichondritis of larynx, 502

Antrum, maxillary—
 acute inflammation of, 253-259
 treatment by irrigation, 257, 258
 chronic suppuration of—
 diagnosis, by transillumination, 267
 exploration and treatment of, 269
 by irrigation through ostium, 269
 „, means of opening in canine fossa, 278
 „, means of permanent opening from inferior meatus, 275
 „, means of radical operation, 278
 „, puncture through alveolar border, 271
 „, puncture through inferior meatus, 273
 symptoms, 264
 (*See also* pp. 262-267)
 mucocele of, treatment, 252

Aphonia, functional, 552 (*see also* Adductor muscles, paralysis of)

Arachnoid fluid, escape of, from nose, 365 (*see also* Rhinorrhœa, cerebro-spinal)

Arsenic, cause of toxic pharyngitis, 439
 use in hay fever, 359

Arsenic—
use in chronic catarrhal rhinitis, 212
,, lupus of pharynx and larynx, 135, 137

Arteries, pulsating, in pharynx, 483

Arthritis, acute septic, following acute tonsillitis, 429, 430

Aryteno-epiglottidean ligaments, 19

Arytenoid cartilages, 19

Arytenoideus muscle, paralysis of, 556

Asch's operation for deviations of septum, 336

Aspirin in treatment of acute tonsillitis and peritonsillitis, 431

Asthma, 365
association of, with hay fever and paroxysmal rhinorrhœa, 365
,, intra-nasal abnormalities, 365
treatment of, intra-nasal, 366

Astringents—
collunaria, 49
gargles, 57
insufflations, 42
lozenges, 59
paints, 40
sprays, 44, 50

Atomiser, De Vilbiss Universal, 33, 46

Atresia of nostrils in tertiary syphilis, treatment of, 149, 159
pharyngeal, in syphilitic lesions, treatment of, 162

Atrophic rhinitis or ozæna, 304-320
(*see Rhinitis, atrophic*)

Auto-insufflator (Leduc's) for laryngeal use, 54, 55

Autoscopy, Kirstein's, 25, 571, 572

BABER's portable incandescent lamp, 2, 3

Bacillus diphtheriae (Klebs-Loeffler's), 92, 93
association with membranous laryngitis, 506
,, with membranous pharyngitis, 423
causation of fibrinous or croupous rhinitis by, 202
distribution among diseases other than diphtheria, 601
distribution among healthy, 600, 601
found in cases of external rhinitis, 601

Badgerow's modification of Blake's snare, 238

Barking cough due to adenoids, 390
"Barking cough of puberty," 544

Bark's gag, 400

Basdon's inhaler, 54

Belladonna, cause of toxic pharyngitis, 439

Bichromate of potassium as a cause of acute rhinitis with perforation of the septum, 206

Bidon, on treatment of spasm of glottis in adults, 543

Blood, diseases of, complications of upper respiratory tract in, 177

Bond (J. W.), on intra-nasal curetting for malignant growths, 373
on laryngotomy as a preliminary to operations on the naso-pharynx and pharynx, 76
,, treatment of nervous laryngeal cough, 544

Bond's burr, 276

Bosworth (F. H.), application of cocaine in simple acute rhinitis, 195
on purulent rhinitis as cause of atrophic rhinitis, 303, 306
,, treatment of acute laryngitis in children, 490, 491
,, lymphatic habit as cause of chronic subglottic laryngitis, 525

Bougies (Schroetter's) in treatment of laryngeal stenosis, 165, 504, 527

Brady's lingual tonsillotome, 459

Breathing exercises after removal of adenoids, 403
as a cure for adenoids (Arbuthnot Lane's method), 393

Bronchi, stenosis of, due to aneurysms, 175

Bronchoscopy (upper and lower) for removal of foreign bodies, 595

Browne (Lennox), nasal speculum, 6
on local treatment in acute pharyngitis, 418
,, tracheotomy in acute oedematous laryngitis, 499

Buccal breathing—
cause of deformities of the upper jaw and septum, 324
symptoms due to adenoids in, 390

Barbul paralysis as a cause of abductor paralysis, 187

Bulla ethmoidalis, 247

Bullock's inhaler, 52

Butlin (H. T.), method of performing thyrotomy, 82, 83
on thyrotomy for malignant disease of larynx, the necessity of thorough removal, 581
the results of, 583
treatment of dilatation of pharynx on lines suggested by him for diverticulae of oesophagus, 481

CALCULI of pharynx, 478

Caldwell, method of radical operation for chronic antral suppuration, 279, 281

Calomel injections, intra-muscular, in syphilis, 157
 Calomel vapour, insufflation of, in tertiary syphilis, 159, 161, 163
 Canine fossa, opening through, in chronic antral suppuration, 278
 Cantharidinate of potassium (Liebreich's), 112
 Carcinoma of larynx, 574 (*see also* under Larynx, malignant growths of)
 of nasal cavities, 371 (*see also* under Nose, malignant growths of)
 ,, naso-pharynx, 413 (*see also* Naso-pharynx, malignant growths of)
 ,, pharynx and tonsils, 464 (*see also* under Pharynx, malignant growths of)
 Cartilage of Santorini, 19
 ,, Wrisberg, 19
 Catarrh, laryngeal, acute, 484-492
 (*see also* Laryngitis, acute, simple)
 chronic, 514-519 (*see also* Laryngitis, chronic, hyperplastic)
 nasal, acute, 189-199 (*see also* Rhinitis, acute, catarrhal)
 chronic, 208-245 (*see also* Rhinitis, chronic catarrhal)
 pharyngeal, acute, 415-418 (*see also* Pharyngitis, acute, simple)
 chronic, 440-448 (*see also* Pharyngitis, chronic, hyperplastic)
 post-nasal, 406-414
 treatment, general and local, 408
 Caustics, chemical, 35
 use of, in larynx, 37
 in nose, 36
 ,, pharynx, 37
 Cautery. *See* Electric cautery
 Cerebro - spinal rhinorrhœa. *See* Rhinorrhœa, cerebro-spinal
 Chest, deformities of, complicating adenoids, 387, 403
 Cheval on treatment of luxation of crico-arytenoid joint, 535
 Cheyne (W. Watson) on malignant disease of pharynx, 468
 ,, and Burghard (F. F.) on reduction of fracture of hyoid bone, 589
 Children, acute laryngitis in (spasmodic laryngitis or croup), 489
 adenoids in, methods of operation for, 397, 401
 fibrinous or croupous rhinitis common to, 202
 haemato-ma and abscess of septum common in, 346
 papilloma of larynx in, methods of removal, 570, 571
 Chondroma of larynx, removal of, 574
 Chorditis tuberosa. *See* Singer's nodes
 Chorea, possible reflex nasal origin of, 355
 Choreic movements of pharynx, 472
 ,, vocal cords, 543
 Chromic acid—
 application in larynx, 38
 in nose, 36, 196
 ,, pharynx, 37
 Cicatrices, formation of—
 after thyrotomy for malignant disease of larynx, 584
 in acute septic perichondritis, 500
 ,, submucous or acute edematous laryngitis, 495
 ,, tertiary syphilis of larynx, 153
 Clark (Sir A.), "barking cough of puberty," 544
 Clergyman's sore throat, 444
 Cocaine—
 application of, for internal operations on upper respiratory tract, 62
 methods of application, 63, 64, 65, 66
 poisoning by, 66
 treatment, 66, 67
 use of, in treatment of acute rhinitis, 195
 ,, acute edematous laryngitis, 498
 Cocaine and supra-renal extract combined, formula, 64
 method of application preliminary to Killian's operation, 340
 Cohen (Solis), method of complete laryngectomy, 582, 584
 Collunaria—
 formulæ, 29, 47, 48, 49
 methods of use, 45-47
 Condyloma of epiglottis, 145
 Congenital bony occlusion of posterior nares, 391
 ,, laryngeal stridor, 597
 ,, webs, 596
 Cooper Rose's bag for arrest of nasal haemorrhage, 73, 74
 Copper, cause of toxic pharyngitis, 439
 Cough—
 due to adenoids, 390
 in chronic laryngitis, 512, 518
 ,, laryngeal complications of tuberculosis, 104, 126
 nervous laryngeal, 544
 reflex nasal origin of, 354
 Creosote, value in laryngeal complications of phthisis, 111
 Crepon, on thyrotomy in tuberculous laryngeal lesions, 122
 Cribiform plate, risk of fracturing, 241, 244, 286

Crico-arytenoid joint, chronic ankylosis of, 533
 diagnosis of abductor paralysis from, 534
 luxation of, without ankylosis, 535
 Cricoid cartilage, acute septic perichondritis of, 499
 malignant growths spreading from posterior surface of, into larynx, 577
 Crises, laryngeal, 186
 Croup. *See* Laryngitis, acute, in children
 Cupric electrolysis. *See* Electrolysis, cupric
 Curette, post-nasal (Gottstein's), 399
 Heryng's, 120
 Curetting operations—
 for adenoids, 399
 ,, atrophic rhinitis, 318
 ,, disease of ethmoidal cells, 283
 ,, intra-nasal malignant disease, 373
 ,, lupus of nose, 136
 ,, nasal polypi, 242
 ,, tuberculous laryngeal tumours, 115
 ,, tuberculous laryngeal ulcers, 112, 120
 Cushmann's dry menthol inhaler, 195
 Cut throat, 588
 Cysts of larynx, 562, 563, 564
 removal of, 574
 of middle turbinal (anterior end), 227
 removal of, 235
 ,, naso-pharynx, 410

DAVOS, suitability in tuberculosis of larynx, 108, 109
 Deafness complicating adenoids, treatment after operation, 402
 Dermoid cysts of pharynx, 464
 Derschied, on Davos in tuberculosis of larynx, 108, 109
 Deviation of septum, 322
 treatment of, 327-345
 De Vilbiss Insufflator, 41, 43
 Nebuliser, 49
 Spray producers, 43
 Universal Atomiser, 33, 46
 Diabetes mellitus, complications of the upper respiratory tract in, 179
 Diet in treatment of dysphagia, 124
 in tuberculosis of the larynx, 109
 Digestive system, diseases of, local complications of, 176
 Diphtheria, 91
 bacillus of (*see* *Bacillus diphtheriae*, Klebs-Loeffler)
 complicating measles, 87
 complicating scarlet fever, 88
 constitutional symptoms of, 93

Diphtheria—
 local manifestations of, 92
 nasal, 201
 diagnosis of fibrinous rhinitis from, 204, 599, 600
 paralyses following, 93, 94, 429
 relation to fibrinous rhinitis, 600
 treatment, 94
 injection of antitoxin for, 94, 95
 question of tracheotomy, 96
 Diploitis, septic, risks after operations on frontal sinus, 288, 291, 293
 Diplopia after operations on frontal sinus, 291
 Discharge, nasal—
 in relation to acute inflammation of accessory sinuses, 253, 254
 ,, relation to atrophic rhinitis, 307, 308
 ,, relation to chronic catarrhal rhinitis, 211
 ,, relation to chronic suppuration of the accessory sinuses, 262, 263, 265, 266
 ,, relation to polypi, 231
 Disseminated sclerosis, laryngeal affections in, 186
 Donelan, on submucous injections in laryngeal tuberculosis, 123
 Doyen's mouth gag, 398
 Drugs, rhinitis due to. *See* Rhinitis, acute, due to internal administration of drugs
 Dry inhalations, 53, 54
 Dunbar, antitoxin treatment of hay fever, 361
 Durham's tracheotomy tube, 78
 Dyspepsia, local complications of, 176
 Dysphagia in laryngeal tuberculosis, treatment of, 124
 in tertiary syphilis, 154
 Dyspnœa complicating diseases of the neck, 174
 in acute laryngitis of infants, 490
 ,, acute septic perichondritis, 502-503
 ,, bilateral abductor paralysis, 549
 ,, chronic ankylosis of crico-arytenoid joint, 534
 ,, chronic tuberculous retro-pharyngeal abscess, 139, 140
 ,, fracture of hyoid bone, 589
 ,, laryngismus stridulus, 539
 ,, spasm of glottis in adults, 541, 542
 ,, tertiary syphilis of larynx, 154
 ,, treatment of, 163
 ,, tuberculous lesions of larynx, 104, 127

EAR complications of adenoids, 387
 of atrophic rhinitis, treatment, 315

Ear speculum. *See* Speculum

Electric cautery—
methods of application, and its dangers, 32-35
use of—
after removal of nasal polypus, 244
,, simple acute rhinitis, 196
for angioma of larynx, 573, 574
,, chronic catarrhal rhinitis, 217
,, chronic pharyngitis, 445, 446
,, chronic tonsillitis, 455, 457
,, diseased lingual tonsil, 459
,, hay fever, 363
,, lupus of larynx, 138
,, pachydermia laryngis, 524
,, tuberculous laryngeal tumours, 116

Electrode, endo-laryngeal (Mackenzie's), 116, 345, 524, 549, 555, 559, 586

Electrolysis, cupric, in atrophic rhinitis, 318

Electro-magnet, extraction of foreign bodies from trachea and bronchi by, 596

Empyema of accessory sinuses of nose, alternating, 259
latent, 259
manifest, 259

Enchondroma, intra-nasal, 370

Enucleation of tonsils, 455

Epiglottis, amputation of, 125
anatomy of, 18
condyloma of, in syphilis, 145
direct examination of, 25
lupus of, 134
paralysis of sphincters of, 558
tertiary syphilitic ulceration of, 152, 154

Epilepsy in relation to adenoids, 390

Epistaxis, 375-379
causes, general and local, 375, 376
in angioma, or bleeding polypus of septum, 370
,, fibroma of naso-pharynx, 411
,, intra-nasal fibroma, 369
,, malignant disease of nose, 372
treatment, 377-379 (*also* 72-74)

Epithelioma. *See* Malignant growths

Erysipelas, complicating sinusitis, 267
of pharynx, 419
,, larynx, 494

Erythema in secondary syphilis of upper respiratory tract, 144-147

Ethmoid bone, results of chronic catarrhal rhinitis on, 226 (*see also* Ethmoid region)

Ethmoid region—
chronic inflammatory affections of, 226-245

Ethmoid region—
pathological changes in, due to periostitis and osteitis, 226-229
bony enlargement of anterior end of middle turbinal, 227
cystic disease of anterior end of middle turbinal, 227
oedema of mucous membrane covering anterior end of middle turbinal, 227
polypi, 228
symptoms of, 229
treatment of, 232-245
(*See also* Polypi, and Turbinal, middle)

malignant disease of, treatment by internal and external operation, 373, 374

Ethmoidal cells—
acute inflammation of, 253-259
anatomy of, 146-150
chronic suppuration of anterior cells—
special symptoms, 266 (*see also* pp. 262-267)
treatment, 281-283
external operation, 283
intra-nasal methods, 282

chronic suppuration of posterior cells—
special symptoms, 266 (*see also* pp. 262-267)
treatment, 296
mucoceles of, 250-253
treatment, 252

Eucaine as local anaesthetic, 62, 66

FACE, changes in, as results of adenoids, 384

Falsetto voice, 185

Faradic battery, uses of, 476, 543, 554, 555, 559

Fauces, perforation of anterior pillars, 481

Fenster-resection. *See* Krieg-Böninghaus's operation

Fevers, acute specific, complications of upper respiratory tract occurring in course of, 86-96

Fibroma, intra-nasal, 369
of larynx, 562
removal of, 573
,, naso-pharynx, 410-413
treatment, 411
removal through the mouth, 412
removal with a snare, 411
,, pharynx, 462-463

Fibro-myxoma of naso-pharynx, 409

Fœtor in acute septic pharyngitis, 421
in atrophic rhinitis, 304, 308, 309
,, laryngitis sicca, 528, 529

Fœtor in acute septic pharyngitis—
in malignant growths of larynx, 578
" " " nose, 372
" " " pharynx, 466
" rhinitis caseosa, 321
" tertiary syphilis of nose, 154
subjective, in chronic sinus suppuration, 263

Foreign bodies—
in bronchi, 593-596
" laryngo-pharynx, 590-591
" larynx, 591-593
" naso-pharynx, 414
" nose, 379-381
" pharynx, 479-480
" trachea, 593-596

Formulae—
collunaria, 29, 47-49
gargles, 56-58
inhalations, dry, 54
steam, 52, 53
insufflations, 33, 42, 43
lozenges and pastils, 58
mixtures, 59
paints, 38, 39, 40, 55
sprays, 31, 44, 49, 50

Fractures—
of hyoid bone, 589
" laryngeal cartilages, 590

Fraenkel's tongue depressor, 10

Francis's method of treatment of asthma, 367

nasal props in treatment of collapse of alæ nasi, 350, 351

Freer's knives for septal operations, 340, 341

Frendenkiel's paint for tuberculous ulcers, 125

Frontal sinus—
acute inflammation of, 253-259
treatment, 258
anatomy of, 246, 250
chronic suppuration of—
special symptoms, 265 (*see also* pp. 262-267)
treatment, 284-293
external operations, 287
after-treatment of, 292
dangers of, 288
indications for, 288
method for exploration, 289
method for securing drainage, 290
method for securing obliteration, 291
intra-nasal operations, 284
irrigation, 285
mucocele of, 250-253
treatment, 252

Fungoid affections of pharynx, 476

GALVANO-CAUTERY. *See* Electric cautery

Gargles—
formulae, 56, 57, 58
Von Troeltsch's method of use, 56

Glanders, 170

Glands, enlargement of—
in lymphadenoma, 178
" malignant disease of larynx, 575, 578
" malignant disease of pharynx, 466, 470
" tuberculosis of pharynx, 128, 129

Gleason's operation for deviations of septum, 331, 339

Globus hystericus, 187, 472

Glottis, rhythmical clonic spasm of, 543
spasm of, in adults, 541
in children, 539

Glottis, sphincter muscles of, 536

Gluck, on extensive operations for removal of malignant growths of larynx, 584, 585

Gonococcus, frequent association of acute purulent rhinitis with, 199

Goodall and Washbourn on irrigation of throat in diphtheria, 95

Gottstein's method of treatment in atrophic rhinitis, 318
post-nasal curette, 399

Gout, lesions of the upper respiratory tract in, 179

Grant (Dundas), on local treatment of laryngeal papilloma, 569
" " on the signs and treatment of chronic laryngitis resulting from catarrhal rhinitis, 515, 518

Grant's (Dundas) laryngeal forceps, 567

Gruber's ear speculum, 6

Grünwald's theory of atrophic rhinitis, 309

Gummata—
in hereditary syphilis, 167
of the larynx, 152
" nose, 148
" pharynx, 150

Gummatous infiltration of perichondrium of larynx, 531

HÆMATOMA and abscess of septum, 346

Hæmorrhage—
after intra-laryngeal operations for tuberculous lesions, 121
after intra-nasal operations, means of arresting, 72
after removal of adenoids, 395
after tonsillotomy—
avoidance of, 451
treatment of, 454

Hæmorrhage—
 in angioma of larynx, 573
 „ acute laryngitis, 485, 488
 nasal (*see also* Epistaxis), 475
 pharyngeal, 482
 secondary, after use of supra-renal extract, 63, 71

Hæmorrhagic diatheses, condition of upper respiratory tract in, 178

Hæmorrhagic laryngitis, 485

Hæmorrhagic swellings in chronic laryngitis, 524
 treatment, 525

Hahn's tube, 82, 83

Hajek, method of opening sphenoidal sinus, 294, 295

Hajek's hook, 282

Hall (F. de Havilland), relation of laryngeal syphilis to malignant disease, 155
 cocaine in treatment of acute œdematosus laryngitis, 498

Hartmann's frontal sinus probe and cannula, 286

Hay fever, 356-364
 association of asthma with, 365
 etiology of, 356
 treatment, 359
 general, 359
 local, 360
 by application of cautery, 363
 „ Dunbar's antitoxin, 361
 „ operative measures, 364
 „ opium pipe, 361

Headaches of nasal origin—
 due to chronic suppuration of the sinuses, 262-267
 „ pressure of middle turbinal on septum, 230

Heart, diseases of, complications of upper respiratory tract in, 174

Heat, methods of applying, 45

Herpes of pharynx, 182

Heryng, method of transillumination, 267

Heryng's curette, 115, 119
 knife, 497, 498
See also Krause and Heryng

Hiatus semilunaris, 247

Hodgkin's disease. *See* Lymphadenoma

Horne (W. Jobson) on etiology of laryngeal tuberculosis, 98

Hovell (T. Mark), method of relieving dysphagia, 433

Hydrorrhœa, nasal, 364

Hyoid bone, fracture of, 589

Hyperæmia, localised, complicating phthisis, 99, 105

Hyperesthesia of pharynx, 475
 of larynx, 559, 561
 „ nose, 354

Hyperosmia, 353

Hyperplasia—
 in chronic laryngitis, 514-519
 „ pharyngitis, 440-446
 „ rhinitis, 214, 225, 231
 „ tonsillitis, 448-456

Hysteria, complications of the upper respiratory tract in, 187, 188

INDIGESTION. *See* Dyspepsia

Infants—
 acute purulent rhinitis in, 199
 „ simple rhinitis in, 198
 „ laryngitis in, 489

hereditary syphilis in, 165, 166

methods of examining larynx in, 25, 26

stridor in, caused by enlargement of thymus, 174

congenital laryngeal, 597

Influenza, complications of upper respiratory tract in, 90

Inhalations. *See* Dry inhalations, Steam inhalations
 use in acute rhinitis, 194, 195
 „ laryngitis, 486, 487, 488
 „ chronic laryngitis, 416, 417
 „ laryngeal tuberculosis, 116, 122

Inhaler (Cushmann's Menthol), 195

Inhalers (Bullock's, Martindale's, Maw's), 52

Injections, intra-laryngeal, 123, 126
 intra-muscular, in tertiary syphilis, 156

Injuries of larynx, 588

Innervation of larynx, 537

Innocent growths of larynx, 562
 of nasal passages, 368
 „ pharynx, 462

Instruments, introduction of, into larynx, 67

Insufflations—
 application of, with formulæ, 41, 42, 43, 54, 55
 application in simple acute rhinitis, 193
 in the treatment of tuberculous laryngeal lesions, 117, 120, 123, 125, 130
 use in simple chronic catarrhal laryngitis, 516

Insufflator for vaporised mercury, 159

Kabierskie's, 41

MacDonald's laryngeal, 42
 De Vilbiss, 41, 43

Inter-arytenoid commissure, 19

Intubation of larynx, 80
 in relief of, in—
 acute œdematosus laryngitis, 498
 acute septic perichondritis, 504
 croup, 491, 492
 laryngismus stridulus, 540
 membranous laryngitis, 507

Irrigation in treatment of—
 acute inflammatory affections of
 nasal accessory sinuses, 257–
 259
 atrophic rhinitis, 311–314
 chronic purulent rhinitis, 303
 chronic suppuration of nasal acces-
 sory sinuses, 269, 272, 275, 276,
 277, 278, 280, 285–287, 292, 294,
 295
 diphtheria, 95
 Irrigator, nasal, application of col-
 lunaria by, 46

JANSEN-MIDDLETON's septal cutting
 forceps, 342

KABIERSKIE's insufflator, 41
 Kanthack (A. A.) on modified forms
 of Klebs-Loeffler bacillus, 601
 Kelly, on keratosis of pharynx, 447
 Keratosis of pharynx, 477–478
 Kidd (P.), on danger of tracheotomy
 in laryngeal tuberculosis, 124
 on haemorrhage from pharynx and
 larynx, 173, 482
 Kidneys, disease of, lesions of upper
 respiratory tract in, 180, 181
 Killian, on obliteration of frontal
 sinus, 292
 method of submucous resection of
 the septum nasi, 340
 on removal of foreign bodies by
 tracheoscopy and bronchoscopy,
 595
 Killian's knife for dividing septal
 cartilage, 341
 tubes for examining larynx, 25
 tubes for removal of laryngeal
 papilloma in children, 571
 Kirstein's direct autoscopy, 25
 in removal of laryngeal papilloma
 in children, 571, 572
 Koch's tuberculin. *See* Tuberculin
 Klebs-Loeffler bacillus (*see* Bacillus
 diphtheriae)
 Koplik's spots, diagnosis of measles
 by, 86
 Krause and Heryng on curettement
 in tuberculous laryngeal ulcers,
 112
 Krause's laryngeal forceps, 567
 " snare, 237, 238
 Krieg-Bönnighaus's operation (Fen-
 ster-resection) for removal of
 deviation of septum, 343
 Küster, method of radical operation
 for chronic antral suppuration, 281

LACK (H. Lambert), method of lar-
 yngoscopy for infants, 26
 on local blood-letting in treatment
 of acute sinusitis, 257

Lack (H. Lambert)—
 on low lateral pharyngotomy for re-
 moval of malignant growths,
 469
 „, fibrinous or croupous rhinitis,
 202, 599, 600
 „, pathology of nasal polypus, 226
 operation for removal of nasal
 polypi, 242
 Lack's silver and rubber plugs in
 after-treatment of operation on
 frontal sinus, 292, 293
 snare, 221, 237, 238
 tracheotomy tube and plug, 165

Lactic acid—
 in treatment of lupus of the
 pharynx, 137
 „, tuberculous laryngeal lesions,
 118, 121
 „, tuberculous pharyngeal lesions,
 130
 methods of application, 37, 38

Lacunar tonsillitis—
 acute, 426, 434
 chronic, 456–458

Lake (R.) on amputation of epi-
 glottis, 125
 method of anterior turbinectomy,
 220

Lake's laryngeal forceps, 115
 rubber splint, 333

Lambkin on intra-muscular injections
 of mercury in syphilis, 156, 157

Lane (W. Arbuthnot), breathing
 exercises in treatment of adenoids,
 393

Laryngeal affections in diseases of
 the nervous system, 185–188

Laryngeal forceps, 114, 115, 520, 566,
 567, 568, 593
 mirror. *See* Laryngoscope

Laryngeal vertigo, 545

Laryngectomy, complete, 582, 583, 584
 contra-indications, 583
 method, 582, 583
 results, 583, 584
 partial, 581, 582, 584
 contra-indications, 583
 results, 583, 584

Laryngismus stridulus, 539–541
 treatment—
 between the attacks, 540, 541
 of the attacks, 539

Laryngitis—
 acute septic—
 membranous, 504
 treatment of, 506–507
 perichondrial, 499
 symptoms and course of, 500
 treatment of, 501–504
 submucous or oedematous, 494
 symptoms and course of, 495
 treatment of, 496–499

Laryngitis, acute septic—
 superficial, 492
 treatment of, 493
 acute, simple—
 in adults, 484
 treatment of, 486-488
 in children (spasmodic laryngitis or croup), 489
 treatment of, 489-492
 acute traumatic, 507-509
 chronic hyperplastic, 510-528
 etiology of, 510
 general treatment of, 513
 varieties—
 catarrhal, 514
 local treatment of, 515-519
 subglottic, 525
 etiology of, 525
 treatment of, 526-528
 with haemorrhagic swellings, 524
 „ pachydermia, 521
 treatment, 523-524
 „ singer's nodes (chorditis tuberosa), 519
 treatment, 520-521
 complicating influenza, 91
 lung diseases, 173
 measles, 87
 phthisis, 99
 treatment of, 106
 typhoid fever, 90
 haemorrhagica, 485
 treatment, 488
 membranous. *See* above under acute septic
 sicca, 428
 treatment, 529-530
 spasmodica. *See* above under acute, simple, in children
 subglottica. *See* above under chronic subglottic
 Laryngo-pharynx, anatomy of, 20
 foreign bodies in, 590
 Laryngorrhœa, 512, 518
 Laryngoscopy, method of, 21
 in children, 25, 26
 structures seen by, 18-20
 Laryngotomy, indications for, 75, 76
 operation, 76
 Larynx—
 abscess of—
 in acute oedematous laryngitis, 495
 „ perichondritis, 500
 „ traumatic laryngitis, 508
 anaesthesia of, 558
 anatomy of, 18
 application of chemical caustics in, 37, 38
 „ „ cold to, 45
 „ „ electric cautery in, 35

Larynx—
 applications, local, for diseases of, 41-44, 51-55
 cartilages of, fracture of, treatment, 590
 changes in, in lesions of the nervous system, 185, 187
 at puberty, 184
 chronic ankylosis of crico-arytenoid joint of, 533 (*see also* Crico-arytenoid joint)
 chronic tuberculous abscess of, 141, 531
 cleansing of, 31, 32
 congenital deformities of, 596
 diseases of, 484-587
 erysipelas of, 494
 erythema of, in syphilis, 144
 examination of, 17
 by Killian's instrument, 25
 „ Kirstein's method of "autoscopy," 25
 „ laryngoscope, 21
 in infants, 25, 26
 „ Röntgen rays for foreign bodies, 25
 foreign bodies in, 591 (*see also* Foreign bodies)
 fractures of, 589 (*see also* Hyoid bone, fracture of)
 hyperaesthesia of, 559
 induction of local anaesthesia in, 65
 inflammatory affections of, acute, 484
 complicating influenza, 91
 lung disease, 173
 measles, 87
 phthisis, 99, 106
 typhoid fever, 90
 chronic, 510
 complicating gout, 179, 180
 injuries of, 588
 innervation of, 537
 innocent growths of, 562
 varieties, 562
 treatment, 566
 intubation of. *See* Intubation
 leprosy of, 170
 local manifestations of diphtheria in, 92
 lupus of, 134
 treatment of, 137
 malignant growths of, 574-587
 diagnosis, 578, 579, 580
 extrinsic growths, 576
 treatment of, operative, 584
 intrinsic growths, 575
 pathological changes, 575-576
 treatment of, operative, 580
 motor phenomena of, in hysteria, 187
 mucous patches of, in syphilis, 144

Larynx—
 muscles of, 536
 neuralgia of, 561
 neuroses of, 536-561
 motor, 536
 sensory, 558
 non-tuberculous lesions complicating phthisis, 99
 treatment, 105
 œdema of—
 in acute septic inflammation of, 494
 „ angio-neurotic œdema, 183
 „ diseases of heart, 175
 „ „ kidneys, 181
 „ syphilis, 154
 operations on, internal, 61-75
 after-treatment, 75
 introduction of instruments, 67
 method of inducing local anaesthesia for, 65
 pachydermia of, 521 (*see also* Pachydermia laryngis)
 parasthesia of, 559
 paralyses of, 545-558 (*see also* Abductor muscles; Adductor muscles, paralysis of; Paralyses, laryngeal)
 perichondritis of, acute septic, 499
 chronic, 530 (*see also* Perichondritis)
 removal of. *See* Laryngectomy
 singer's nodes of, 519-521 (*see also* Singer's nodes)
 stenosis of, 164, 504
 syphilitic changes in—
 hereditary, 167
 primary, 143
 secondary, 144-148
 tertiary, 151-165
 tuberculous lesions of—
 etiology, 98
 pathological changes, classification of, 99
 description of, 100-103
 symptoms, 103-105
 treatment, general, 106
 diet, 109
 hygiene and climate, 107
 medicinal, 109-112
 open-air sanatoria, 107
 treatment, local, 112
 advisability of intra-laryngeal surgical operations, 112-114
 of miliary tuberculosis, 114
 „ local tumours, 114
 „ subglottic œdema, 116
 „ limited infiltration, 116
 by inhalations, sprays, &c., 116
 by the application of caustics, 118
 Larynx, tuberculous lesions of—
 treatment, local—
 by surgical measures, 119
 intra-laryngeal operations, 119
 „ external operations, 122
 of extensive infiltration, 122
 intra-laryngeal methods, 122
 external operations, 123
 „ destructive ulceration, 124
 treatment, symptomatic, 124-128
 ulceration of, complicating diseases of the lungs, 173
 ventricles of, anatomy, 19
 Lead, cause of toxic pharyngitis, 439
 Leduc's auto-insufflator for laryngeal use, 54, 55
 Leeches, application to larynx, 45
 Leiter's tubes, application of, 45
 Leprosy of upper respiratory tract, 169
 Leptothrix buccalis, 477
 Leukaemia, condition of the upper respiratory tract in, 178
 Lichwitz's trochar, 273
 Liebreich's cantharidinate of potassium. *See* Cantharidinate
 Lingual tonsil, disease of, 458
 Lipoma of larynx, removal of, 574
 Lister's sinus forceps for opening peritonissilar abscess, 433
 Liver, cirrhosis of, epistaxis in, 177
 Locomotor ataxy. *See* Tabes dorsalis
 Loewenberg's forceps, 398
 Lombard's bone forceps, 291
 Low's treatment of atrophic rhinitis with mucin, 319
 Lozenges, 58, 59
 Ludwig's angina, 419
 Lungs, diseases of, complications of upper air passages occurring in, 173
 Lupus of the upper air passages, 133
 of the larynx, 134
 „ nose, 133
 „ pharynx, 133
 treatment, general, 135
 local, 136
 Luxation of crico-arytenoid joint, 535
 Lymph systems, complications of upper respiratory tract in diseases of, 177
 Lymphadenoma (Hodgkin's disease), condition of upper respiratory tract in, 178
 diagnosis of sarcoma of tonsil from, 465
 Lympho-sarcomatosis, diagnosis of sarcoma of tonsil from, 465

MACBRIDE (P.) on cupric electrolysis in treatment of atrophic rhinitis, 318

on thyrotomy for papillomata in children, 573

MacDonald (G.), on the minute anatomy of the nasal mucous membrane, 210

on breathing in subjects of adenoids, 389

„ cause of abnormal width of nasal fossæ, 307

„ the nature of nasal polypus, 228

MacDonald's laryngeal insufflator, 42

snare, 220, 221

tampons in treatment of atrophic rhinitis, 319

Macintyre on extraction of foreign bodies by electro-magnet, 596

Mackenzie (Hunter), case of obstinate epistaxis treated radically, 379

on tracheotomy for the cure of laryngeal papillomata in children, 572

Mackenzie (Sir M.), on internal administration of opium for hay fever, 360

on guaiacum in treatment of acute tonsillitis, 431

„ treatment of laryngismus stridulus, 540

„ value of tincture of aconite in treatment of neuralgia of pharynx, 476

Mackenzie's (Sir M.) endo-laryngeal electrode, 549, 555, 559

guarded knife, 163, 497, 498

laryngeal forceps, 566, 593

snare, 220, 222, 238

Mahu, on injection of cold paraffin in treatment of nasal deformities, 161

Mahu's intra-nasal cutting forceps, 233

Malignant disease, tertiary syphilitic lesions, starting point of, 155

Malignant growths of larynx, 574

of nasal passages, 371

„ naso-pharynx, 413

„ pharynx, 464

Mandl's fluid, formula of, 38

Marmorek's antitoxin. *See* Antitoxin

Martindale's Inhaler, 52

Massage, vibratory, in atrophic rhinitis, 317

Maw's Inhaler, 52

Maxillary sinus—

acute inflammation of, 253

treatment of, 257

chronic suppuration of, 264, 269

mucocoele of, 251, 252

Measles, complications of upper respiratory tract in, 86

diagnosis of, by Koplik's spots, 86

Mediastinum, diseases of, local complications of, 174

Mercury, cause of toxic pharyngitis, 438

acid nitrate of, application in nose, 37

exhibition of, in syphilis of the larynx, 143, 146, 156, 157, 158

in treatment of membranous laryngitis, 506, 507

Meyer, on bacilli found in fibrinous rhinitis, 599

Meyer's ring-knife, 243, 244

Miliary tuberculosis of larynx, 100, 114

of pharynx, 128

Mixtures, 59

Moure (E. J.), on method of opening peritonsillar abscess, 434

operation for deviations of septum, 334, 339

Moure's (E. J.) spoke-shave, 329

Mucin in treatment of atrophic rhinitis, 319

Mucoceles of accessory cavities of nose, 250

Muscles of larynx, 536

Mycosis leptothrixia. *See* Keratosis of pharynx

Myxoma of larynx, removal of, 573

NASAL fossæ, abnormal width, causes of, 307

in relation to ozaena, 308

Nasal haemorrhage, site of predilection, 376 (*see also* Epistaxis)

Nasal obstruction, deviation of septum caused by, 324

due to adenoids, clinical results and symptoms of, 383-391

„ chronic catarrhal rhinitis, 216

high arched palate due to, 324

in sinus suppuration, 262

symptom common to all forms of catarrhal rhinitis, 211

symptom of nasal polypi, 231

Nasal passages, innocent growths of, 368 (*see also* Angioma, Enchondroma, Fibroma, Osteoma, Papilloma)

malignant growths of, 371 (*see also* Sarcoma and Carcinoma)

Nasal polypus, 228

treatment of, 237

Nasal probe, 8

Nasal props (Francis's) in treatment of collapse of alæ nasi, 350, 351

Nasal saw, 329

Nasal septum—

anatomy of, 322, 323

affections of, 322-351

Naso-pharyngeal catarrh (*see* Catarrh, post-nasal)

Naso-pharynx, application of electric cautery in, 35
 application of insufflations in, 41, 42
 of paints in, 38
 method, 38, 39
 „ sprays in, 49
 atrophic rhinitis, complications of, treatment in, 314, 315
 cleansing of, 30, 45, 46, 47
 cysts of, 410
 diseases of, 382-414
 cause of chronic laryngitis, 511
 examination of, 12
 by posterior rhinoscopy, 12
 digital method, 16
 foreign bodies in, 414
 induction of local anaesthesia, 64
 innocent growths of. *See also*
 Cysts, Fibroma, Fibro-myxoma
 malignant growths of, treatment, 413
 operations on, after-treatment, 74
 plugging of, for haemorrhage, 74
 Nebuliser (De Vilbiss), 49
 (Rouse), 49
 Nephritis, chronic interstitial, epistaxis complicating, 180
 oedema of larynx complicating, 181
 Nerve, olfactory, neuroses of, 332 (*see*
 Anosmia, Hyperosmia, Parosmia)
 Nerve supply of laryngeal muscles, 537, 538
 Nerves, diseases of, causing laryngeal paralysis, 185-188, 545
 causing pharyngeal paralysis, 473
 Nervous laryngeal cough, 544
 Nervous system, diseases of, condition of upper respiratory tract in, 185-188
 Neuralgia, of nasal origin, 230, 231
 of larynx, 561
 „ pharynx, 475
 Neuroses—
 of upper respiratory tract following influenza, 91
 of larynx, motor—
 affections of co-ordination, 543
 paralyses, 545
 spasmodic affections, 538
 sensory, 558 (*see also* Anæsthesia, Hyperæsthesia, Paræsthesia, and Neuralgia)
 of pharynx, motor—
 spasmodic affections, 472
 paralyses, 473
 sensory, 475
 nasal, 352-367
 reflex neuroses—
 direct, 354, 356-365 (*see* Hay Fever)
 referred, 355, 365-367 (*see* Asthma)
 attributable to adenoids, 390

Neuroses, nasal—
 sensory—
 of olfactory nerve, 352
 of sensory nerves, 354
 New growths of larynx, 562-587
 of nasal passages, 368-374
 „ naso-pharynx, 409-413
 „ pharynx, 462-471
 Nitrate of silver, methods of application, 36, 37, 38
 Nitric acid, methods of application, 36, 37
 Nodes, singer's. *See* Singer's nodes
 Nose, accessory sinuses of—
 anatomy of, 246-250
 diseases of, 250-297
 adhesions between septum and outer wall of nose, 348
 cleansing of, 28
 by collunaria, 45, 46, 47
 congenital bony occlusion of, 391
 deformities of, paraffin injections for the correction of, 160
 diseases of, 189-381
 causing chronic laryngitis, 511
 causing chronic pharyngitis, 441
 erythema of, in syphilis of, 144
 examination of, 4
 foreign bodies in, 379
 diagnosis of fibrinous or croupous rhinitis from, 204
 glands of, 170, 171
 hyperæsthesia and paræsthesia of, 354
 inflammatory affections of, acute, 189
 chronic, 208, 246, 298
 innocent growths of, 368 (*see also*
 Angioma, Enchondroma, Osteoma, Papilloma)
 leprosy of, 169
 lesions of, in acromegaly, 179
 in disturbances of sexual functions, 184
 local manifestations of diphtheria in, 93 (*see also* Rhinitis, membranous)
 lupus of, 133
 treatment of, 136
 malignant growths of, 371
 treatment, 372
 by external operations, 373
 „ intra-nasal operations, 373
 „ operation through the mouth, 374
 „ palliative measures, 374
 operations on, intra-nasal—
 after-treatment, 70
 arrest of haemorrhage, 72
 means of preventing adhesions, 71
 prevention of sepsis, 71
 method of inducing local anaesthesia for, 63

Nose—
 rhinoscleroma of, 171
 syphilitic changes in—
 hereditary, 166-167
 primary, 142
 secondary, 144
 tertiary, 148
 syringing of, 29, 47
 tuberculous lesions of, 131, 132
 use of chemical caustics in, 36
 ,, dry inhalations in, 53, 54
 ,, insufflations in, 41, 42, 54
 ,, paints in, 38
 ,, sprays in, 49
 ,, steam inhalations in, 51, 52
 Nostrils, atresia of, in tertiary syphilis, 159
 Nystagmus of pharynx, 472, 473
 O'Dwyer's intubation tubes, 81
 Edema, angio-neurotic, of upper respiratory tract, 183
 of larynx—
 in acute septic inflammation, 494
 ,, diseases of the heart, 175
 ,, nephritis, 181
 ,, mucous membrane of anterior end of middle turbinal, 227
 subglottic, in tuberculous lesions of larynx, 101, 116, 122, 124
 Esophagus, growths in, complications of, 176
 Olfactory region, 352
 Ollier, external operation for malignant growths of the nose, 374
 Open-air treatment in laryngeal tuberculosis, 107
 Oro-pharynx, diseases of, 415
 inflammatory affections of, acute, 415
 chronic, 446. *See also* Pharynx
 Orthoform powder, insufflations of, in tuberculosis of larynx, 120, 125
 in tuberculosis of pharynx, 130
 Osler, W., on laryngeal paralysis complicating aneurysms of aorta, 175
 Osteitis of ethmoid bone, pathological changes due to, 226
 Osteoma, intra-nasal, 370
 Otitis complicating adenoids, 387
 treatment of, 402
 media, acute, after removal of adenoids, 395
 after use of douches, 30
 ,, electric cautery, 34
 ,, syringing nose, 29
 Ozæna or stench in atrophic rhinitis, 308
 series of changes finally resulting in, 308
 supposed connection with suppuration in accessory sinuses, 309
 (*See also* Rhinitis, atrophic)

PACHYDERMIA laryngis, 521
 Paget (S.) on paraffin injections for deformities of nose, 160, 161
 Paints and their application, 38, 55
 Palate, high arched, association of deviations of septum with, 324
 soft, adhesions of, in syphilitic lesions, 151
 treatment of, 161
 lupus of, 133, 137
 paralysis of, complicating acute septic tonsillitis, 429
 complicating diphtheria, 93, 94
 in diseases of the nervous system, 187, 473, 474
 tuberculous lesions of, 128
 Papaine, insufflation of, for tuberculosis of larynx, 117
 Papilloma—
 of larynx, 562
 treatment—
 general, 573
 local, in adults, 566
 ,, in children, 570
 ,, nasal cavities, 368
 ,, pharynx, 462
 Paraesthesia of larynx, 559
 of nose, 355
 ,, pharynx, 475
 Paraffin injections in correction of nasal deformities, 160, 161
 injections of, in treatment of collapse of alæ nasi, 351
 ,, of (submucous) in atrophic rhinitis, 316
 Paralyses of upper respiratory tract—
 complicating aneurysms, 175
 diphtheria, 93, 94
 diseases of the heart, 174
 diseases of the lungs, 174
 diseases of the nervous system, 185-188
 diseases of the mediastinum, 174
 hysteria, 187
 influenza, 91
 typhoid fever, 90
 laryngeal—
 general etiology, 545
 of muscles supplied by recurrent laryngeal nerve, 546-557
 ,, muscles supplied by superior laryngeal nerve, 557-558
 pharyngeal—
 etiology, 473
 treatment, 474
 of soft palate—
 complicating acute tonsillitis, 429
 diphtheria, 93, 94
 diseases of the nervous system, 186-188, 473, 474
 Paralysis agitans, movements of vocal cords in, 187

Paralysis—
 bulbar, progressive amyotrophic, changes in palatal, pharyngeal, and laryngeal muscles in, 187
 general, laryngeal spasm and abductor paresis in, 187

Parasitic (fungoid) affections of pharynx, 476

Paresis of palate complicating surgical treatment of adenoids, 396

Parker's tracheotomy tube, 77, 78

Parosmia, 353

Parotid tumours, growths of pharynx resembling, 464

Paroxysmal sneezing, 356

Pastils, 58

Paterson's forceps, combined use with Killian's tubes, 571, 572

Pegler (L. H.), advocacy of Moure's operation for deviation of septum, 336

Pemphigus of pharynx, 183

Perforation of septum, 347

Perichondritis of larynx—
 acute septic, 449
 symptoms and course, 500
 treatment, 501-504
 chronic, 530
 special forms of, 531
 complicating cancer, 530, 577
 syphilis, 153, 530
 tuberculosis, 103, 530
 typhoid fever, 90

Periostitis of ethmoid bone, 226

Peritonsillitis, acute, 426
 treatment, general, 430, 431
 local, 432

Perverted action of vocal cords, 188

Pharyngeal pouch, 481

Pharyngitis—
 acute septic, 419
 membranous, 423
 submucous, 420
 superficial, 422
 acute simple, 415
 „ traumatic, 435
 chronic hyperplastic, 440-461
 etiology, 440
 treatment, general, 442
 varieties—
 general chronic, 443
 granular, 444
 hyperplastica lateralis, 445
 with elongated uvula, 446

complicating diphtheria, 92
 gout, 179
 influenza, 91
 lung diseases, 173
 measles, 86
 phthisis, 128
 rheumatism, 180
 scarlet fever, 87
 typhoid fever, 90

Pharyngitis—
 sicca, 459
 toxic, 438

Pharyngo-mycosis. *See* Keratosis of pharynx

Pharyngoscopy, 10, 11

Pharyngotomy, lateral, for removal of malignant growths, 469, 584
 sub-hyoid, for removal of malignant growths, 469, 584

Pharynx—
 application of caustics in, 37
 of cold to, 45
 „ dry inhalations in, 53, 54
 „ electric cautery in, 35
 „ insufflations in, 41, 42, 54, 55
 „ paints in, 39, 40, 41, 55
 „ sprays in, by patient, 50
 „ steam inhalations in, 51, 52
 anaesthesia of, 475
 asymmetry and irregularities of, 483
 atresia of, in syphilitic lesions, treatment of, 162
 calculi of, 478
 cleansing of, 30
 clinical results of adenoids in, 385
 dilatation of, 481
 diseases of, 415-483
 erythema of, in syphilis, 144
 examination of, 9
 foreign bodies in, 479
 fungoid affections of, 476 (see Keratosis, Thrush)
 haemorrhage from, 482
 herpes of, 182
 hyperaesthesia of, 475
 inflammations of, acute, due to general infection, 419
 due to local infection, 419 (see also Pharyngitis, acute septic ; Tonsillitis, acute septic)
 innocent growths of, 462 (see also Adenoma ; Angioma ; Dermoid cysts ; Fibroma ; Papilloma ; Parotid tumours, growths of pharynx resembling)
 leprosy of, 169
 lesions of, complicating gout, 179
 lupus of, 133
 treatment of, 135
 malignant growths of, 464-471
 treatment—
 palliative, 470, 471
 surgical, 467
 feasibility of, 467
 methods of, 468

mycosis of, 477

neuralgia of, 475

neuroses of—
 motor, paralyses, 473
 „ spasmodic affections, 472
 sensory, 475

Pharynx—
 paræsthesia of, 475
 parasitic (fungoid) affections of, 476
 pemphigus of, 183
 septic inflammation of, 419
 syphilitic lesions of—
 hereditary, 167
 primary, 142
 secondary, 144, 146, 147
 tertiary, 150, 151, 154, 156, 161
 tuberculosis of, 128
 Phlegmon of. *See Pharyngitis, acute, septic*
 Phonic-spasm of larynx, 544
 Phthisis, complications of—
 laryngeal, 98–128
 nasal, 131–132
 pharyngeal, 128–131
 Pigeon-breast due to adenoids, 387
 Pollantin in hay fever, 361
 Polypi, nasal, clinical appearances, 229
 nature of, 228
 symptoms and diagnosis of, 229–232
 treatment of, 237–245
 Polypus, bleeding, of septum. *See Angioma*
 fibro-mucous, of naso-pharynx. *See Fibro-myxoma*
 Post-nasal catarrh, 406
 curette (Gottstein's), 399
 Potassium, iodide of, cause of toxic pharyngitis, 439
 in the treatment of tertiary syphilis, 156
 dangers of, in syphilis of larynx, 158
 Puberty, changes in the upper respiratory tract at, 184
 barking cough of, 544
 Purulent rhinitis—
 acute, 199
 chronic, 302
 Pulsating arteries of pharynx, 483

QUINSY. *See Abscess, tonsillar and peritonsillar*

RACHITIS a cause of laryngismus stridulus, 178
 Recurrent laryngeal nerve, paralysis of, 546
 Respiratory tract, upper—
 complications of—
 in acromegaly, 179
 ,, aneurysms, 175
 ,, blood diseases, 177
 ,, cardiac diseases, 174
 ,, cutaneous diseases, 181
 ,, digestive disorders, 176
 ,, diphtheria, 91–94

Respiratory tract, upper—
 complications of—
 in diseases of nervous system, 185
 ,, glanders, 170
 ,, gout, 179
 ,, influenza, 90
 ,, leprosy, 169
 ,, measles, 86
 ,, mediastinal diseases, 174
 ,, phthisis, 97
 ,, pulmonary diseases, 173
 ,, renal diseases, 180–181
 ,, rhinoscleroma, 171
 ,, scarlet fever, 87–88
 ,, sexual disturbances, 183
 ,, smallpox, 88, 89
 ,, syphilis, 142–169
 ,, typhoid fever, 89–90
 ,, whooping-cough, 91
 diseases of—
 local treatment, methods (with formulæ), 28–60
 remedies employed by the patient, 44–59
 remedies employed by surgeon, 28–44
 mixtures (formulæ) for, 59, 60
 examination of, 1–27
 operations on, external. *See Thro-tomy, Intubation, Laryngotomy, Laryngectomy, Pharyngotomy, Tracheotomy*
 internal, 61
 induction of local anaesthesia, 62–67
 preliminary steps, 61–67
 after-treatment, 70–75
 Retro-pharyngeal abscess, chronic tuberculous, 138
 operative treatment of, 139–141
 traumatic, method of opening, 438
 Rheumatism, lesions of the upper respiratory tract in, 180
 acute, complicating acute tonsillitis, 429, 430
 Rhinitis, complicating gout, 179
 acute, complicating measles, 86
 ,, due to internal administration of drugs, 205
 ,, due to local infection, 199, 201 (*see also Rhinitis, membranous; Rhinitis, purulent, acute*)
 ,, due to local irritants, destructive form, 206
 simple form, 205
 acute catarrhal—
 in adults, 189
 treatment, general and local, 192–196
 preventive, 196–198
 in infants, 198

Rhinitis, acute catarrhal—
 atrophic, or *ozæna*, 304
 definition, 304
 etiology, 306-308
 explanation of *ozæna*, 308
 Gruenwald's explanation, 309
 pathological changes, 304
 prophylactic measures against, 311
 treatment, 311
 general, 314
 local—
 by cleansing and physiological rest, 311-314
 ,, other methods, 316-320
 of complications, 314-316

caseosa, 320, 321

chronic catarrhal, 208
 classification of forms, 209
 etiology, symptoms, and general treatment common to all forms, 210-213
 various forms—
 pathological changes, special symptoms, and local treatment, 213-245
 of ethmoid region and middle turbinate—
 cysts of the middle turbinal, 227
 treatment, 235, 236
 enlargement of anterior end of middle turbinate bone, 227
 treatment, 233-236
 œdema of mucous membrane, 227
 treatment, 236-237
 polypi, 228-229
 treatment, 237-245
 of inferior meatus, mucous membrane of—
 slight general thickening, 213
 treatment, 216, 217
 true hyperplasia, 214-216
 treatment, 225
 tumefaction, 213, 214
 treatment, 217-225
 by means of cautery, 217
 ,, caustics, 219
 ,, turbinectomy, 219
 partial, 219-223
 complete, 223-225

chronic dry, 298-302
 anæmic type, 301
 plethoric type, 298
 septum, perforation of, in, 299

external, associated with Klebs-Loeffler bacillus, 601

Rhinitis, fibrinous or croupous, definition, etiology, symptoms, and course of, 202-204
 notification and isolation of, 205, 599

membranous, 201
 varieties—
 fibrinous rhinitis, 202
 nasal diphtheria, 201
 traumatic, 201

purulent, acute, 199-201
 chronic, 302-304
 a cause of atrophic rhinitis, 306
 a cause of arrest of development in inferior turbinates, 307

Rhinoliths, 381

Rhinorrhœa, cerebro-spinal, 365
 idiopathic. *See* Hydrorrhœa
 nasal, 364

Rhinoscleroma, 171

Rhinoscopy, anterior, 6
 posterior, 12

Rickets, chief predisposing course of laryngismus stridulus, 539, 540

Ring-knife (Meyer's), 243, 244

Röntgen rays. *See* X-rays

Rouge's operation in nasal sarcoma and carcinoma, 373

SADDLE-BACK nose, 149, 167

Santi, de (Philip, R. W.) on pathological identity of acute septic diseases of pharynx, larynx, and neck, 419, 420

Santorini, cartilages of, 19

Sarcoma of larynx, 574 (*see also* under Larynx, malignant growths of) of naso-pharynx, 413 (*see also* Naso-pharynx, malignant growths of), nose, 371 (*see also* Nose, malignant growths of)

,, pharynx and tonsils, 464, 465 (*see also* Pharynx, malignant growths of)

,, tonsil, differentiation from lymphadenoma (Hodgkin's disease) and diffuse lymphosarcomatosis, 465

Saw, nasal, 329

Scarification in acute œdematosus laryngitis, 497, 498
 in acute peritonsillitis, 433

Scarlet fever, complications of upper respiratory tract in, 87

Schmidt (M.) on treatment of spasm of glottis in adults, 543

Schroetter on curetttement in tuberculous laryngeal ulcers, 112
 on treatment of webs of the larynx, 597

Schroetter's bougies in treatment of stenosis of larynx, 165, 504

Schuchardt on microscopical changes in atrophic rhinitis, 306

Sclerosis, disseminated, laryngeal complications of, 186

Sedatives, applications, 40, 41, 43, 44, 52

Semon (Sir F.) on use of atomised vaselin in the nose, 33

on "perverted action" of cords, 188

" pathological identity of acute septic diseases of pharynx, larynx, and neck, 419, 424

" proclivity of abductors to succumb to paralysis before adductors, 538

" risks of malignant disease after removal of papillomata of larynx, 573

" thyrotomy for removal of multiple laryngeal papillomata, 570

" treatment of nervous laryngeal cough, 544

" treatment of spasm of glottis in adults, 543

" value of Dunbar's antitoxin in hay fever, 361

" inhalation of oxygen in acute oedematous laryngitis, 497

" results of thyrotomy for intrinsic malignant disease of larynx, 583

Septic laryngitis, 492

" pharyngitis, 419

Septum—

- adhesions between septum and outer wall of nose, 348, 349
- angioma or bleeding polypus of, 369, 370
- deformities of, 322-345
- treatment, operative, 328
- deviations of, complicating atrophic rhinitis, treatment, 316
- dislocation of anterior triangular cartilage, 326-327
- method of operation for, 344
- haematomata and abscess of, 346, 347
- perforation of, 347
- in chronic dry rhinitis, 299, 301
- spurs and deviations of, 322-345
- etiology, 322-324
- pathological changes (spurs, deviations, and dislocations), 325, 326
- treatment, operations for deviations—
- Asch's, 336-337
- Gleason's, 331-334
- Killian's submucous resection, 340-343
- Krieg-Bönnighaus's or Fenster-resection, 343-344

Septum, spurs and deviations of—

- treatment—
- Moure's, 334-336
- removal of deviated portion, 337-339
- removal of dislocated end of septal cartilage, 344
- removal of spurs, 328-330
- various other methods, 345

Septum knife, 328

Sestier on submucous or acute oedematous laryngitis, 494

Sexual functions, lesions of the upper respiratory tract associated with, 183, 184

Siegle's Steam Spray, 49

Silver, nitrate of. *See* Nitrate of silver

Singer's nodes, or chorditis tuberosa, 519-521

Sinus forceps (Lister's), 433

Sinus pyriformis, 20

Sinuses, accessory, of nose, diseases of, 246-297

Skin, diseases of, lesions of the upper respiratory tract in, 181

Small-pox. *See* Variola

Smurthwaite (H.), method of inducing local anaesthesia preliminary to Killian's operation, 340

Smurthwaite's elevator, 340

Snare—

- Blake's, Badgerow's modification, 238
- Krause's, 237, 238
- Lack's, 220, 221, 237, 238
- Macdonald's, 220
- Mackenzie's, 220, 222, 238

" Snuffles," nasal, in hereditary syphilis, 166

Sneezing, paroxysmal, 356

Spasmodic affections of larynx, 538

of pharynx, 472

Speculum, Gruber's ear, 6

Killian's nasal, 8

Lennox Browne's, nasal, 6

Thudichum's, nasal, 6

method of using, 6

Spencer (W. G.), plastic operation for adhesions of palate to posterior wall of pharynx, 162

Sphenoidal sinus—

- inflammation of, acute—
- treatment by irrigation, 259
- chronic suppuration of—
- complicating atrophic rhinitis, 315
- diagnosis, 267
- exploration, 293
- symptoms, special, 266 (*see also* pp. 262-267)
- treatment, 294-296

Sphincters of epiglottis, paralysis of, 558

Spicer (R. H. Scanes) on paraffin injections for the correction of nasal deformities, 161

on combined local and general anaesthesia for removal of laryngeal papilloma in children, 570

„ forcible dilatation in treatment of collapse of alæ nasi, 351

Spoke-shave (Carmalt Jones), 221, 224

Moure's, 329

Spray producers (De Vilbiss), 43

Sprays, local application of, 43, 44, 49, 50, 51

Steam inhalations, use of, 51, 52

Stenosis, intra-laryngeal in tertiary syphilis, 164

subsequent to acute septic perichondritis, treatment, 504

Stimulants, application as—

- collunaria, 48
- gargles, 57
- lozenges, 58, 59
- paints, 38, 55
- sprays, 50
- steam inhalations, 53

Stomach, disorders of, complications of, 176

Stomatitis, complications of, 176

Stoerk on curettement in tuberculous laryngeal ulcers, 112

Stoerk's laryngeal guillotine, 569

Streptococcal infection of pharynx complicating scarlet fever, 87, 88

infection in membranous laryngitis, 505

Streptococcus erysipelatosus (Fehl-eisen's), identity of streptococcus pyogenes with, 420

pyogenes, cause of acute septic diseases of pharynx, larynx, neck, and tonsils, 419, 420, 425, 494

Stridor in infants caused by enlargement of thymus, 174

congenital laryngeal, 597

Subglottic region, 20

Suppuration, chronic, of accessory sinuses, 259-297

Supra-renal extract for internal operations on upper respiratory tract, 63, 71

Supra-tonsillar fossa, 426, 458

Symonds (C. J.) on irrigation of frontal sinus, 287

Syphilis of upper respiratory passages, 142-169

- hereditary, 165-169
- treatment of, 168
- primary, 142, 143
- secondary, 143-148
- treatment, 146

Syphilis—

- tertiary, 148-165
- cause of atrophic rhinitis, 308
- of chronic subglottic laryngitis, 525
- pathological changes—

 - in larynx, 151-154
 - „ nose, 148
 - „ pharynx, 150

- treatment—

 - general, 156
 - local—

 - in larynx, 162
 - in nose, 158
 - in pharynx, 161

Syringing of nose, 29, 47

Syringomyelia, laryngeal changes in, 186, 187

TABES DORSALIS, laryngeal complications in, 185

Tampons (Macdonald's), in treatment of atrophic rhinitis, 319

Gottstein's, 318

Teeth, care of, in syphilis, 146

irregularities of, result of adenoids, 384, 386

Tensor muscles of vocal cords, 536

 - external, paralysis of, 557, 558
 - internal, paralysis of, 556, 557

Therapeutic methods and formulæ, 28-60

Thomson (St. Clair), case of septic diploitis, 291

on cerebro-spinal rhinorrhea, 365

Thorax, walls of, deformities of, due to adenoids, 387

Thrush, 476-477

Thudichum's nasal speculum, 6

method of use, 6

Thymus, enlargement of, cause of stridor in infants, 174

Thyrotomy, operation of, 82-84

after-treatment, 83

in acute septic perichondritis—

 - for removal of sequestrum, 503
 - for subsequent stenosis, 504
 - „ children, for removal of papilloma, 573
 - „ chronic subglottic laryngitis, 527
 - „ laryngeal stenosis of tertiary syphilis, 164
 - „ removal of foreign bodies in larynx, 593
 - „ removal of intrinsic malignant growths of larynx, 581, 583, 587
 - results, 583, 584
 - „ removal of laryngeal papilloma in adults, 569, 570
 - „ treatment of bilateral abductor paralysis, 550

Thyrotomy—

in tuberculous laryngeal lesions, 122
 Tilley (H.) on removal of tonsils with punch forceps, 457, 458
 Tod (Hunter) on Fenster-resection operation for deviated septum, 343

Todd (C.) on external rhinitis, 601

Tongue, base of—

anatomy, 18
 examination of, with laryngoscope, 25

Tongue-depressor, 10, 11, 12

Tonsillitis—

acute simple. *See* Pharyngitis, acute simple
 acute septic—
 complications following, 428
 acute rheumatism, 429, 430
 paralysis of the palate, 429
 etiology, symptoms and course, 425-428
 prophylactic treatment, 435
 varieties of, 424
 lacunar—
 pathological changes, 426
 treatment, 434, 435
 parenchymatous—
 pathological changes, 425
 treatment, 430-434
 peritonsillar—
 pathological changes, 426
 treatment, 430-434
 ulcerative. *See also* Angina, Vincent's
 pathological changes, 427
 treatment, 434

chronic, 448-458

hyperplastic, 448
 etiology, pathological changes and symptoms, 449-450
 treatment, 450-456
 methods of reducing size of—
 by electric cautery, 455
 " punch forceps, 456
 methods of removing—
 enucleation, 455
 removal with snare, 455
 tonsillotomy, 452-455

chronic lacunar—

etiology, pathological changes and symptoms, 456, 457
 treatment, 457, 458

Tonsillotome (Sir M. Mackenzie's), 453
 in removal of tonsils for chronic tonsillitis, 452, 453, 457

Tonsillotomy, 452

Tonsils, cauterisation of, for chronic tonsillitis, 455
 calculi in, 478
 chancre of, 143

chronic enlargement of, 448

Tonsils—

enlarged, removal, as preventive measure against acute laryngitis (croup) in children, 492
 enucleation of, 455
 foreign bodies in, 479
 lingual, disease of, 458-459
 malignant growths of (*see* Pharynx, malignant growths of)
 reduction of size of, with electric cautery, 455
 with punch forceps, 456
 removal of—
 avoidance of haemorrhage in, 451
 indications for, 450
 methods of—
 by enucleation, 455
 with tonsillotomy, 452
 " snare, 455
 sarcoma of, 465

Tornwaldt's disease, 407, 409

Trachea, stenosis of, due to aneurysms, 175
 stricture of, result of tertiary syphilis, 153

Tracheoscopy, upper and lower, for removal of foreign bodies, 595

Tracheotomy—

as curative measure in treatment of laryngeal papilloma in children, 571, 572
 indications for, 77
 in relief of diphtheria, 96
 of acute oedematous laryngitis, 498, 499
 " acute septic perichondritis, 502
 for dyspnoea, 502, 503
 for subsequent stenosis, 504
 " acute traumatic laryngitis, 508, 509
 " chronic subglottic laryngitis, 527
 " dyspnoea in bilateral abductor paralysis, 549, 550
 in croup, 491, 492
 " laryngeal stenosis of tertiary syphilis, 164
 " laryngismus stridulus, 540
 " membranous laryngitis, 507
 " tuberculous laryngeal lesions, 123

method of performing, 77

posture of patient, 78
 question of anaesthetic, local or general, 77

Tracheotomy tube, Durham's, 77, 78, 79

Parker's, 77, 78

Transillumination in diagnosis of antral suppuration, 267

Trichloracetic acid, application in nose, 36

von Troeltsch's method of gargling, 56
 Tube feeding necessary in complete anaesthesia of larynx, 559
 in tuberculous laryngeal lesions, 126
 Tubercle, local deposit of, as a cause of chronic perichondritis, 531
 miliary, of larynx, 100, 114
 of pharynx, 128
 Tuberculin (T. R.), Koch's, in laryngeal tuberculosis, 111
 „, in lupus, 135
 Koch's original, in laryngeal tuberculosis, 112
 Tuberculomata, localised, laryngeal, 113
 nasal, 131
 Tuberculosis, cause of atrophic rhinitis, 308
 complicating syphilitic lesions, 155
 of larynx, 100
 cause of chronic subglottic laryngitis, 525
 diagnosis of malignant growths, from, 579 (*see also Larynx, tuberculous lesions of*)
 „, nasal cavities, 131 (*see also Nose, tuberculous lesions of*)
 „, pharynx, 128 (*see also Pharynx, tuberculosis of*)
 Tumours, laryngeal, 562-587
 nasal, 368-374
 naso-pharyngeal, 409-413
 pharyngeal, 462-471
 Turbinals—
 inferior—
 „, application of cocaine and supra-renal extract to, 218
 „, arrested development caused by chronic purulent rhinitis leading to abnormal width of nasal fossa, 307
 „, cauterisation of, in after-treatment of simple acute rhinitis, 196
 „, cauterisation of, in treatment of asthma, 367
 in chronic rhinitis, 217-219
 „, importance of, 224
 „, pathological changes due to chronic catarrhal rhinitis, 213-224
 general thickening, 213
 treatment, 216, 217
 hyperplasia, 214-216
 treatment, 225
 tumefaction, 213, 214
 treatment, 217-225
 „, removal of, in hay fever, 364
 „, in chronic rhinitis, partial and complete, 219-225
 „, tuberculomata of, 131
 Turbinals—
 middle—
 „, pathological changes due to chronic catarrhal rhinitis, 226-245
 bony enlargement, 227
 treatment of, 233, 234
 cystic disease, 227
 treatment of, 235, 236
 mucoceles of, 227
 oedema of the mucous membrane, 227
 treatment of, 236, 237
 polypi, 228, 232
 treatment of, 237-245
 „, removal of, in hay fever, 364
 „, in suppuration of ethmoidal cells, 296
 „, in frontal sinusitis, 284, 285
 Turbinectomy, complete, 223
 partial, anterior, 219-221
 „, posterior, 221-223, 331
 Turner (A. Logan) on cystic disease of middle turbinal, 227
 on mucoceles of maxillary antrum, 250
 „, opening and exploration of frontal sinus, 289
 Turner (J.) on overcrowding and irregularity of teeth in subjects of adenoids, 385
 Typhoid fever, complications of respiratory tract in, 89
 ULCERATION of upper respiratory tract in the course of typhoid fever, 89
 syphilitic—
 laryngeal, 152
 nasal, 149
 pharyngeal, 145, 150
 tuberculous, laryngeal—
 deep and destructive, 102, 118, 124
 superficial, 101, 116
 nasal, 131-132
 pharyngeal, 128
 Urticaria of upper respiratory tract, 182
 Uvula, elongated, 446
 treatment by amputation, 447, 448
 lupus of, 133
 miliary tuberculosis of, 128
 scarification or amputations of, in simple acute pharyngitis, 418
 VALENTINE on microscopical changes in atrophic rhinitis, 306
 Vallecula, 18

Varicella, complications of upper respiratory tract in, 89

Variola, complications of upper respiratory tract in, 88

Vaseline, atomised, protection of cauterised wound in nose by, 33, 34

Vaso-motor turgescence of nasal mucous membrane. *See* Hay Fever

Ventricles of larynx, anatomy of, 19, 20
malignant disease commencing in, 576

Ventricular bands, anatomy of, 19
malignant disease commencing in, 576

Vertigo, laryngeal, 545

Vierordt, case of chronic subglottic laryngitis intimately associated with goitre, 526

Vincent's angina, 427

Vocal cords, anatomy of, 19
ataxic movements of, 186, 187
changes in, at puberty, 185
choreic movements of, 543
congenital web between, 596
cicatricial web between, result of tertiary syphilis, 153
false. *See* Ventricular bands
malignant disease of, 575
possible connection with chronic laryngitis, 512
paralyses of, 545-558
positions of, 537

Voice, alterations of, at puberty, 184
in tertiary syphilis, 154
,, tuberculous lesions of larynx, 104
,, malignant disease after operations, 584
misuse of, a cause of chronic laryngitis, 511
a cause of chronic pharyngitis, 441

Voice-production, lessons in, as a means of preventing recurrence of singer's nodules, 521
importance of, in paralysis of internal tensors, 557

WAGNER (Clinton) on Colorado Springs as health resort in laryngeal tuberculosis, 109

Walsham's operation for collapse of alæ nasi, 351
for septal deformities, 345

Washbourne on diphtheria complicating measles, 87 (*see also* Goodall and Washbourne)

Web, laryngeal—
congenital, 596
syphilitic, 153

Weir Mitchell treatment in adductor paralysis, 554
in sensory neuroses of pharynx, 476

White's palate hook, 16

Whooping-cough, complications of upper respiratory tract in, 91

Williams (P. Watson) on recoveries after intubation, 81
case in which posterior ethmoidal cells alone were diseased, 266

laryngeal forceps, 567, 593

on laryngeal paralysis in tabes, 186
,, salicylate of soda in acute peritonsillitis, 431
,, symptoms of acute sinus inflammation, 254
,, treatment of simple acute laryngitis in singers, 487

submucous injections in laryngeal tuberculosis, 123

Wingrave (V. Wyatt) on pathological and microscopical changes in atrophic rhinitis, 305

Woakes (E.) on association of inflammatory changes in ethmoid bone with pathological processes occurring in bone, 226

Wolfenden (R. N.) on relief of dysphagia in laryngeal tuberculosis, 125

Wrisberg, cartilages of, 19

X-RAYS, diagnosis of foreign bodies in trachea and bronchi by, 594
examination of larynx by, for detection of foreign bodies, 25
help in removal of foreign bodies from trachea and bronchi, 595
location of foreign bodies in larynx by, 592

ZINC, cause of toxic pharyngitis, 439

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